



HIGH PERFORMANCE
WHEEL BALANCER

MODEL 1200, 1400, 1500

Service Manual



Model 1500



Model 1400



Model 1200

APRIL, 2003

All information contained or disclosed in this document is considered confidential and proprietary by Accu Industries Inc. All manufacturing, use, reproduction, and sales rights are reserved by Accu Industries Inc. and the information contained herein shall not be used in whole or in part without the express written consent of Accu Industries Inc.

Table of Contents

INTRODUCTION

GENERAL	I
FUNCTIONAL DESCRIPTION	I
BASIC BALANCER OPERATION	I
WEIGHT APPLICATION	I
ALU MODES	I
STATIC 1 AND 2 MODE	I
DISPLAY / CONTROL PANEL	I
GENERAL SPECIFICATIONS AND MACHINE FEATURES	II
IMPORTANT SAFETY INSTRUCTIONS	III
ELECTRICAL SAFETY PRECAUTIONS	IV
SERVICE GUIDELINES / HANDLING STATIC SENSITIVE PCB'S	IV

CHAPTER 1 AC/DC POWER DISTRIBUTION

LOCKOUT AND/OR TAGOUT SYSTEM PROCEDURE	1-1
ELECTRICAL REQUIREMENTS	1-1
AC THEORY OF OPERATION	1-2
AC DISTRIBUTION	1-2
DRIVE MOTOR	1-2
DC THEORY OF OPERATION	1-2
PROCESSOR BOARD	1-2
ENCODER BOARD	1-2
DISTANCE POTENTIOMETER (MODEL 1400, 1500)	1-2
DIAMETER POTENTIOMETER (MODEL 1500, 1400)	1-2
WIDTH POTENTIOMETER (MODEL 1500)	1-3
TRANSDUCERS	1-3
DISPLAY BOARD	1-3
KEYPAD	1-3
AUTO STOP LOCK SWITCH (MODEL 1500)	1-3
TROUBLESHOOTING	1-4
PROCESSOR PCB	1-6
KEYPAD SCHEMATIC 1200 & 1400	1-10
KEYPAD SCHEMATIC 1500	1-10

CHAPTER 2 THEORY OF OPERATION

FUNCTIONAL DESCRIPTION	2-1
BALANCER COMPONENTS	2-2
ELECTRONIC POWER BOX	2-2
MAIN PROCESSOR PCB	2-2
KEYPAD	2-2
DISPLAY PCB	2-3
TEMPERATURE SENSOR	2-3
DRIVE MOTOR	2-3
TRANSDUCERS	2-3
SAPE (SEMI-AUTOMATIC-PARAMETER-ENTRY)	2-3
ENCODER	2-3
VIBRATORY SYSTEM	2-4

CHAPTER 3 CHECKOUT, CALIBRATION AND MAINTENANCE

GENERAL	3-1
WHEEL SPIN FUNCTIONALITY	3-1
BALANCING WITHOUT SLIP CHECK	3-1
SHAFT IMBALANCE, WHEEL ADAPTER TO SHAFT REMOUNT TEST	3-1
BALANCER DIAGNOSTICS (TROUBLESHOOTING)	3-2
TROUBLESHOOT USING CORRECT DIAGNOSTICS PROCEDURES	3-2
TOOLS REQUIRED WHEN SERVICING THE ACCU BALANCERS	3-3
DEFINITION OF TERMS	3-4
INPUT KEYS / DISPLAY WINDOWS	3-5
GENERAL OPERATION	3-6
MANUAL DATA ENTRY	3-6
SAPE OPERATION	3-6
NON HWM SAPE DATA ENTRY	3-7
HWM SAPE DATA ENTRY	3-7
SAPE WEIGHT APPLICATION	3-7
3D SAPE (1500 ONLY)	3-7
SERVICE CODES	3-8
ACCESSING THE SERVICE CODES	3-8
C CODE DESCRIPTIONS	3-8
C4 UNBALANCE COMPENSATION (ALL MODELS)	3-8
C7 VOLUME AND AUDIBLE TONES	3-8
C11 STOP AT TOP (ONLY 1400 AND 1500)	3-8
C12 COUNTER INDICATION	3-9
C14 USER CALIBRATION	3-9
C15 STICKY AT TOP (ONLY 1400, 1500)	3-9
C28 LAST 10 KERNEL ERROR MESSAGES	3-10
C43 RESET SPIN COUNTERS	3-10
C47 CONFIGURE THE FLASH	3-10
C66 - C67 ENGINEERING AND MANUFACTURING PURPOSES	3-10
C72 MECHANICAL PHASE SHIFT OF VIBRATORY SYSTEM	3-10
C74 INDICATION OF POSITION COUNTER (ENCODER INSPECTION)	3-11
C75 ENGINEERING AND MANUFACTURING PURPOSES	3-11
C76 INDICATION OF ALL ADAPTED VOLTAGES AFTER CALIBRATION WITH C83	3-11
C80 2D SAPE ARM CALIBRATION	3-11
C81 SAPE ARM ZERO	3-12
C82 3D SAPE CALIBRATION	3-13
C83 FACTORY CALIBRATION PROCEDURE	3-14
C84 COMPENSATION OF THE RESIDUAL MAIN SHAFT UNBALANCE	3-15
C85 CALIBRATION DATA TRANSFER FROM CPU PCB TO ENCODER PCB	3-16
C86 CALIBRATION DATA TRANSFER FROM ENCODER PCB TO MAIN CPU PCB	3-16
C88 ANGULAR UNBALANCE POSITION	3-16
C111 MEASURING THE BELT TENSION	3-17
FACTORY CALIBRATION SEQUENCE	3-17
SERVICING THE BALANCER	3-18
CONTROL PANEL REMOVAL & REPLACEMENT	3-18
MAIN PROCESSOR REPLACEMENT	3-18
TO ACCESS THE INSIDE OF THE MACHINE	3-19
POWER SUPPLY BOX	3-19
REMOVING THE POWER ENTRY MODULE:	3-19
INSTALLATION OF THE POWER ENTRY MODULE:	3-19
VIBRATORY MEMBER REMOVAL	3-21
VIBRATORY INSTALLATION	3-21
ENCODER REMOVAL	3-21
DIAMETER SAPE / POTENTIOMETER MODEL 1400 & 1500	3-22

DIAMETER SAPE / POTENTIOMETER ADJUSTMENT	3-22
SAPE GAUGE	3-22
DISTANCE SAPE / POTENTIOMETER 1400 & 1500	3-23
DISTANCE SAPE / POTENTIOMETER INSTALLATION 1400 & 1500	3-23
WIDTH SAPE / POTENTIOMETER INSTALLATION	3-23
MECHANICAL BRAKE CABLE	3-24
MOTOR REMOVAL	3-24
V BELT TENSION ADJUSTMENT	3-25
VOLTAGE MODIFICATION	3-26

APPENDIX A CODES

KERNEL CODES	3-1
ERROR CODES	3-7

INTRODUCTION

GENERAL

The Model 1200, 1400 and 1500 balancers are designed to compute static and dynamic imbalance of car, light truck, motorcycle and truck wheels. The Model 1200, 1400 and 1500 has a delay of approximately 8 to 10 seconds during power up. During the delay, the processor electronics are checking the status of all electronics. These components include the Encoder board, the transducers, the thermocouple, the power interface board, the display board, and the membrane switch. After the status check is complete (approximately 8-10 seconds) the units beeps, the displays all light up, and then the unit goes to the idle state and displays "dIS 115" The unit is now ready for parameter inputs and can take measurements.

FUNCTIONAL DESCRIPTION

BASIC BALANCER OPERATION

Once the balancer reaches balancing speed 130 - 190 RPM, calculation is done. Once the weight imbalance and location is known the balancer will reverse polarity sending 230VAC via a relay on the Power Supply Board to the motor bringing the shaft to a stop. Imbalance amounts and corrective weight locations will be shown on the display.

WEIGHT APPLICATION

Rotate the wheel until all weight location LED's light up. Apply the corrective weight at top dead center (12 o'clock position) on the wheel.

ALU MODES

In addition to the standard Dynamic and Static modes there are 5 ALU modes, each of which are illustrated by LEDs on the balancer touch panel when activated. ALU modes 1 through 5 are accessed by first toggling the ALU MODE key until the balancing mode desired is displayed. See the Operator's Manual for an explanation of ALU Mode balancing. The last used mode will again be used even when power is cycled.

STATIC 1 AND 2 MODE

Static mode balancing allows the operator to balance custom wheels in a true dynamic mode using concealed weights while maintaining specified weight separation. See the Operator's Manual for an explanation of Static mode balancing.

DISPLAY / CONTROL PANEL

The display of the Model 1200, 1400 and 1500 balancer shows weight amount and position for counterbalancing, plus acts as a message center for the operator of the machine or for the technician who is repairing the machine.

Everytime the machine powers on, the software automatically performs a system check. The Main Processor performs a Semi Automatic Parameter Entry error check. If the Semi Automatic Parameter Entry is good the machine enters idle state as normal. If one of them fails, for example, the distance gauge fails, machine displays an **Error Code** when the machine is powered on. If diameter gauge fails, it displays an **Error Code**. The operator must press the "**STOP**" button to exit the display and enter idle state. The machine masks the function of the failed part after Semi Automatic Parameter Entry check. For example, if the diameter gauge fails, the machine disables the measurement of diameter and measures the distance only. Or if the distance gauge fails the machine disables the measurement of the distance gauge and measures the diameter only.

GENERAL SPECIFICATIONS AND MACHINE FEATURES

Performance Specifications:

	Model 1200	Model 1400	Model 1500
Shipping weight	293 lbs (133kg)	310 lbs	326 lbs. (148kg)
Cabinet size - width (to end of shaft)	33.5"	38.5"	38.5"
Cabinet size - depth	24"	25.5"	27.5"
Cabinet size - height (to top of display)	43.5"	43.5"	65.5"
Shaft Speed in rpm Variable :	130-190 Variable :	130-190 Variable :	130-190
Cycle time - 30 lb. Assembly	5 sec	5 sec	5 sec
Cycle time - 60 lb. Assembly	7.5 sec	7.5 sec	7.5 sec
Cycle time- 75 lb. Assembly	9 sec	9 sec	9 sec
Accuracy	1 gr (.035 oz)	1 gr (.035 oz)	1 gr (.035 oz)
Wheel width capacity	1"-20"	1"-20"	1"-20"
Wheel diameter capacity	8"-24"	8"-24"	8"-24"
Tire width capacity	20.9" (530 mm)	20.9" (530 mm)	20.9" (530 mm)
Tire diameter capacity	44" (117 mm)	44" (117 mm)	44" (117 mm)
Shaft capacity - maximum	154 lbs. (70 kg)	154 lbs. (70 kg)	154 lbs. (70 kg)

Hardware Features:

	Model 1200	Model 1400	Model 1500
Weight storage pockets	12	16	25
Parameter entry	Manual (+/- keys)	2 Auto entry	3 auto entry
Display positioning	Integrated in tray	Integrated in tray	Raised Tower
Cone storage	4 left side pegs	Integrated in tray	Integrated in tray
Power requirements	115V/60Hz	115V/60Hz	220V I Phase
Spindle lock - foot activated	YES	YES	YES
Shaft diameter	40 mm	40 mm	40 mm
Shaft length (backing collar to end)	190 mm	190 mm	190 mm
Centering Nut	Quick Nut - Plastic	Quick Nut - Plastic	Quick Nut - Plastic
Cone system	3 cone: 43-116 mm	3 cone: 43-116 mm	3 cone: 43-116 mm
Wheel Hood	YES -full coverage	YES -full coverage	YES -full coverage
Weight pliers	Standard	Standard	Standard
Width Calipers	Standard	Standard	Standard
Calibration weight	Standard	Standard	Standard

Software Features:

	Model 1200	Model 1400	Model 1500
Multiple Operator	YES-2	YES-4	YES - 9
Distance arm holds weight (Accu Stik)	NO	YES	YES
Hidden Spoke program	NO	YES	YES
Weight position pulse brake	NO	YES	YES
Stop at Top outside plane	NO	YES	YES
Balancing Modes - ALU	4	4	4
Balancing Modes - Motorcycle	2	2	2
Automatic Brake after spin	YES	YES	YES
Balancing Modes - Static & Dynamic	YES - 2 static	YES- 2 static	YES- 2 static
Match Balance Mode	YES	YES	YES
PAX Balancing Mode	YES	YES	YES
Inch / millimeter toggle	YES	YES	YES
Fine (.1oz) / Std. (.25oz) round-off toggle	YES	YES	YES
Truck round-off mode	YES	YES	YES
Auto start with hood down	YES	YES	YES
Auto recalculation w/ changed parameters	YES	YES	YES
Operator Cal slug Calibration	YES	YES	YES
Integrated error codes	YES	YES	YES
Integrated counter functions	YES	YES	YES
Integrated instructional Info system	YES	YES	YES

IMPORTANT SAFETY INSTRUCTIONS

When using this equipment, basic safety precautions should always be followed, including the following:

1. Read all instructions.
2. Do not operate equipment with a damaged power cord or if the equipment has been damaged until it has been examined by a qualified authorized service technician.
3. If an extension cord is used, a cord with a current rating equal to or more than that of the machine should be used. Cords rated for less current than the equipment may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled.
4. Always unplug equipment from electrical outlet when not in use. Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.
5. To reduce the risk of fire, do not operate equipment in the vicinity of open containers of flammable liquids (gasoline).
6. Keep hair, loose fitting clothing, fingers and all parts of the body away from moving parts.
7. Adequate ventilation should be provided when working on operating internal combustion engines.
8. To reduce the risk of electric shock, do not use on wet surfaces or expose to rain.
9. Do not hammer on or hit any part of the control panel with weight pliers.
10. Do not allow unauthorized personnel to operate the equipment.
11. Use only as described in this manual. Use only manufacturer's recommended attachments.
12. Always securely tighten the wing nut before spinning the shaft.
13. **ALWAYS WEAR SAFETY GLASSES.** Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.
14. Balancer is for indoor use only.

ELECTRICAL SAFETY PRECAUTIONS

Make sure the balancer is unplugged before disconnecting any wires in preparation for replacing any boards, cables or other items within the unit. Use the “*Lockout and/or Tagout*” procedure outlined in Chapter 1.

SERVICE GUIDELINES / HANDLING STATIC SENSITIVE PCB'S

Electrostatic discharge can destroy high impedance ICs if uncontrolled. Use the following techniques to avoid damaging ICs:

- Leave new circuit boards in their antistatic bags until ready for use.
- When replacing boards, proms, etc. be sure to turn off power to the machine first.
- Use an anti-static wrist strap. Connect it to chassis ground on the equipment or to an available raw ground.
- Touch the chassis of the equipment to put yourself at the same static potential as the equipment.
- Grasp the PCB from opposite sides using your fingertips. Do not grasp the components on the board.



When inserting PCB's:

- Place boards on a grounded static mat after removal.
- Remove the new PCB from the original package onto a grounded static mat. Save packaging to use when returning defective boards.
- Remove power from the machine (unplug from wall) before installing the PCB.
- Avoid handling components needlessly.
- Do not set PCBs on insulating surfaces such as paper, glass, rubber, or plastic.
- Static is generated by friction. The following actions promote static generation:
- Wearing silk or nylon clothing.
- Walking on carpets.
- Walking with rubber soled shoes.

Static generation is increased when certain environmental conditions exist. Conditions of low humidity combined with wearing silks or nylons, walking on carpets, or walking with rubber soled shoes may create large electrostatic charges on your person, capable of blowing a hole in the substrate of an IC.

CHAPTER 1

AC/DC POWER DISTRIBUTION

LOCKOUT AND/OR TAGOUT SYSTEM PROCEDURE

1. Notify all affected employees that a lockout or tagout system is going to be utilized and why. The authorized employee should know the electrical power the machine uses and it's hazards.
2. If the machine or equipment is running, shut it down by the normal stopping procedure (depress the stop button, open toggle switch, etc.)
3. Use appropriate devices to isolate the equipment from the power source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air gas, steam or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.
4. Lockout and/or tagout the energy isolating devices with individual lock(s) or tag(s).
5. After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate. **CAUTION: RETURN OPERATING CONTROL(S) TO "NEUTRAL" OR "OFF" POSITION AFTER THE TEST [DE-ENERGIZED STATE].**
6. The equipment is now locked out or tagged out.

ELECTRICAL REQUIREMENTS

**NOTE: ANY ELECTRICAL WIRING MUST BE PERFORMED BY LICENSED PERSONNEL.
ALL SERVICE MUST BE PERFORMED BY AN AUTHORIZED SERVICE TECHNICIAN.**

Check on the plate of the machine that the electrical specifications of the power source are the same as that of the machine.

NOTE: THE ACCU BALANCERS PERFORM A SELF-TEST ROUTINE ON START-UP. THERE IS A DELAY OF SEVERAL SECONDS BEFORE THE DISPLAY IS ACTIVATED.

NOTE: ANY ELECTRICAL OUTLET INSTALLATION MUST BE VERIFIED BY A LICENSED ELECTRICIAN BEFORE CONNECTING THE BALANCER.

NOTE: ENSURE THAT THE OUTLET HAS AN AUTOMATIC GROUND FAULT CIRCUIT BREAKER WITH A DIFFERENTIAL CIRCUIT SET AT 30 MA.

AC THEORY OF OPERATION



Always use the "One Hand Rule" when working with AC voltages by keeping one hand in your pocket or behind your back. Before removing wires from the Balancer, always verify that the unit is "OFF". Turn off the Main Power Switch on the back and unplug the AC power cord from the AC outlet.

AC DISTRIBUTION

The balancer requires 230VAC (Model 1500) 115 VAC (Model 1200, 1400) for proper operation. The AC voltage comes in through a switch and immediately is sent to the Power Supply PCB via X41 pin 1. The drive motor is the only component that requires the 230VAC $\pm 10\%$. The primary voltage applies 230V, 60Hz AC to the balancer via the hot side (Black Wire) of the AC power cable. The Main Power routes to one side of the "ON/OFF" Rear Panel Power Switch. The hot wire continues to one side of the Line Filter. The neutral side routes to the other side of the Line Filter. The earth ground directly connects to the balancer chassis, and the Line Filter. It is critical to have the proper input voltage in order for the balancer to operate correctly.

DRIVE MOTOR

The drive motor for the unit receives AC power VIA two relays mounted directly to the Power Supply Board. To keep arcing at the relays to a minimum the relays are switched in synchronism. The switching times of the relays are determined individually and taken into consideration for optimum pull-in times. The motor also utilizes a capacitor to generate a sufficient amount of torque during acceleration and braking.

DC THEORY OF OPERATION

PROCESSOR BOARD

The operating voltage for the Main Processor is 5VDC. It receives this power from the Power Supply Board at X1 pins 32 and 34. This 5 volts also passes through the Processor Board and supplies the Encoder PCB and both the Distance and Diameter SAPE.

ENCODER BOARD

The encoder receives 5VDC from the Processor Board. This voltage can be measured at the Processor Board at X3 pin 6. The encoder is built so that there are no adjustments. The encoder disk is built onto the shaft and cannot be replaced without replacing the vibratory member. The encoder is fitted in the vibratory tube and consists of a reflective slotted sleeve which is mounted on the main shaft and the optoelectronic unit.

DISTANCE POTENTIOMETER (MODEL 1400, 1500)

The distance potentiometer is a 10K pot. It is supplied 5VDC from the main processor. This input voltage can be measured at the Processor Board X6 pin 3. The output voltage is dependent upon the deflection of the guage from the home position.

DIAMETER POTENTIOMETER (MODEL 1500, 1400)

The diameter potentiometer is a 10K pot. It is supplied 5VDC from the main processor. This input voltage can be measured at the Processor Board X7 pin 3. The output voltage is dependent upon the rotation of the guage from the home position.

WIDTH POTENTIOMETER (MODEL 1500)

The width potentiometer is a 5K pot. It is supplied 5VDC from the main processor. This input voltage can be measured at the Processor Board X8 pin 3. The output voltage is dependent upon the rotation of the guage from the home position.

TRANSDUCERS

The transducers are installed in a manner that it forms a virtual transducer on each end of the shaft. This configuration gives the balancer greater accuracy along with minimal amount of erroneous readings. Both measuring transducers are arranged in one plane. The transducers produce a DC output. The DC voltage that is generated is sent back to the processor.

DISPLAY BOARD

The Display Board receives 5VDC from the Power Supply Board. This 5 volts can be checked at the harness of the display board X2 pin 6 or at the Power Supply Board X2 pin 6.

KEYPAD

The keypad allows operator input to the Main Processor Board. The output signal passes through the Power Supply Board directly to the Main Processor.

AUTO STOP LOCK SWITCH (MODEL 1500)

The auto lock switch receives 5VDC from the Power Supply Board when the balancer is in the ALU-S mode. The voltage can be measured at the Power Supply Board at X13 pin 1&2 .

TROUBLESHOOTING

COMPLAINT	CORRECTIVE ACTION
I. Machine will not power up.	Is the machine plugged in at the wall? NO-> Plug machine in. Is the balancer plugged in at the back? NO-> Plug machine in. Are all connectors seated properly? NO-> Reseat connectors. Are the fuse(s) inside the switch good? NO-> Replace the fuse(s) Is 230VAC present at X41 pin 1? NO-> Checking wiring. Is 5 VDC LED lit up on Processor Board? NO-> Replace Processor Board. Is 5 VDC present at pins 3 and 6 at X2? NO-> Replace Power Board. Are LED lit up on Display Board? NO-> Reload Software Replace Display Board.
II. Machine will not brake.	Is 230 VAC present at X43 pins 2 during brake cycle? NO-> Replace Power Board. (Retest) Replace Processor Board. (Retest) Replace the encoder. (Retest) Replace the Motor. (Retest)
III. Keypad will not function.	Use keypad schematic jumper pins of non working function. NO-> Replace keypad. (Retest) Replace Display Board. (Retest) Replace Main Processor. (Retest)
IV. Distance gauge does not work.	Is the distance arm in the HOME position during power up? NO-> Place it in the home position and retest. Check pins 1 and 3 at connector X6 on the Processor Board. Is the voltage reading 5 VDC +/- 1 volt? NO-> Replace Processor Board and retest.

Press C80 and pull the distance gauge out, does the voltage reading on the display change?

NO-> Check to make sure string is attached to distance gauge.
Replace potentiometer.

Check C80 with the SAPE in the home position, is the voltage reading correct?

NO-> Readjust voltage reading to desired setting.

V. Diameter gauge does not work.

Is the diameter arm in the HOME position during power up?

NO-> Place it in the home position and retest.

Check pins 1 and 3 at connector X7 on the Processor Board.
Is the voltage reading 5 VDC +/- 1 volt?

NO-> Replace Processor Board and retest.

Press C80 and move the SAPE gauge up, does the voltage reading on the display change?

NO-> Check to make sure the cog wheels are meshed.
Replace potentiometer.

Check C80 with the SAPE in the home position, is the voltage reading correct?

NO-> Readjust voltage reading to desired setting.

VI. Width gauge does not work.

Is the width arm in the HOME position during power up?

NO-> Place it in the home position and retest.

Model 1500 only

Check pins 1 and 3 at connector X8 on the Processor Board.
Is the voltage reading 5 VDC +/- 1 volt?

NO-> Replace Processor Board and retest.

Press C82 and move the SAPE to the flange, does the voltage reading on the display change?

NO-> Check to make sure the cog wheels are meshed.
Replace potentiometer.

Check C82 with the SAPE in the home position, is the voltage reading correct?

NO-> Readjust voltage reading to desired setting.

VI. Machine chases weights.

Are the mounting accessories in good condition?

NO-> Clean backing plate and all accessories.
Replace if necessary.

Has the balancer been calibrated?

NO-> Perform C14 and retest.
Perform C80,C81,C82,C83,C84,C88 and retest
(Pruefroter required).

NOTE: A FINE BALANCED TIRE AND
WHEEL ASSEMBLY ALONG WITH A 3.5 OUNCE
WEIGHT CAN BE SUBSTITUED.

Check vibratory system mounting bolts, are they tight?

NO-> Tighten to specification and retest.

Are both the Front and Rear transducers tight?

NO-> Adjust to specification and retest.

Check C74, does the left display change from 0 to 511?

NO-> Replace the Encoder Board. (Retest)

Replace the Main Processor. (Retest)

Replace the Vibratory System. (Retest)

Does the shaft spin smoothly and freely?

NO-> Replace vibratory system. (Retest)

PROCESSOR PCB

X1 - From Power Supply Board.

X3 - Encoder, Transducers & Temp Sensor.

- Pin 6=5 VDC

X6 - Distance SAPE

- Pin 1=Gnd
- Pin 2=Output
- Pin 3=5 VDC

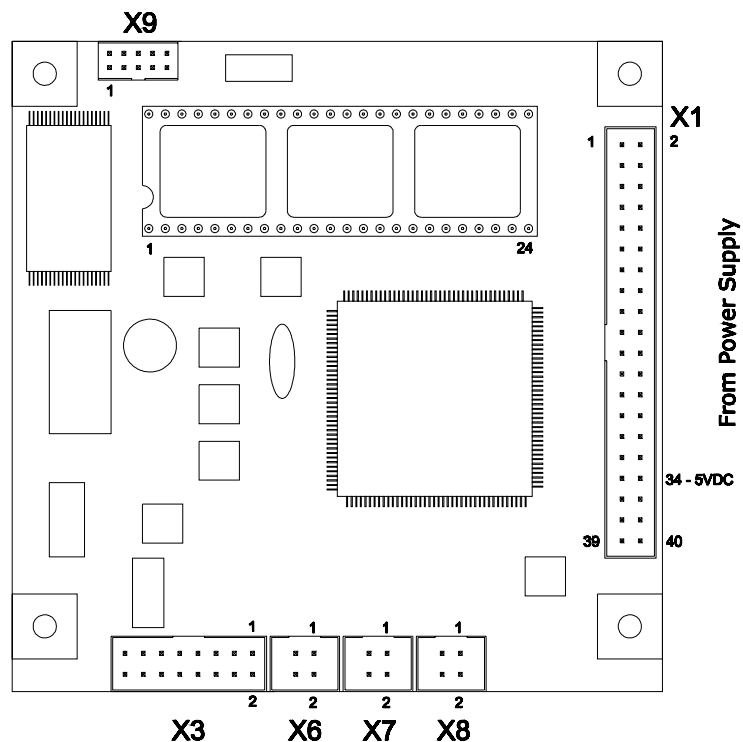
X7 - Diameter SAPE

- Pin 1=Gnd
- Pin 2=Output
- Pin 3=5 VDC

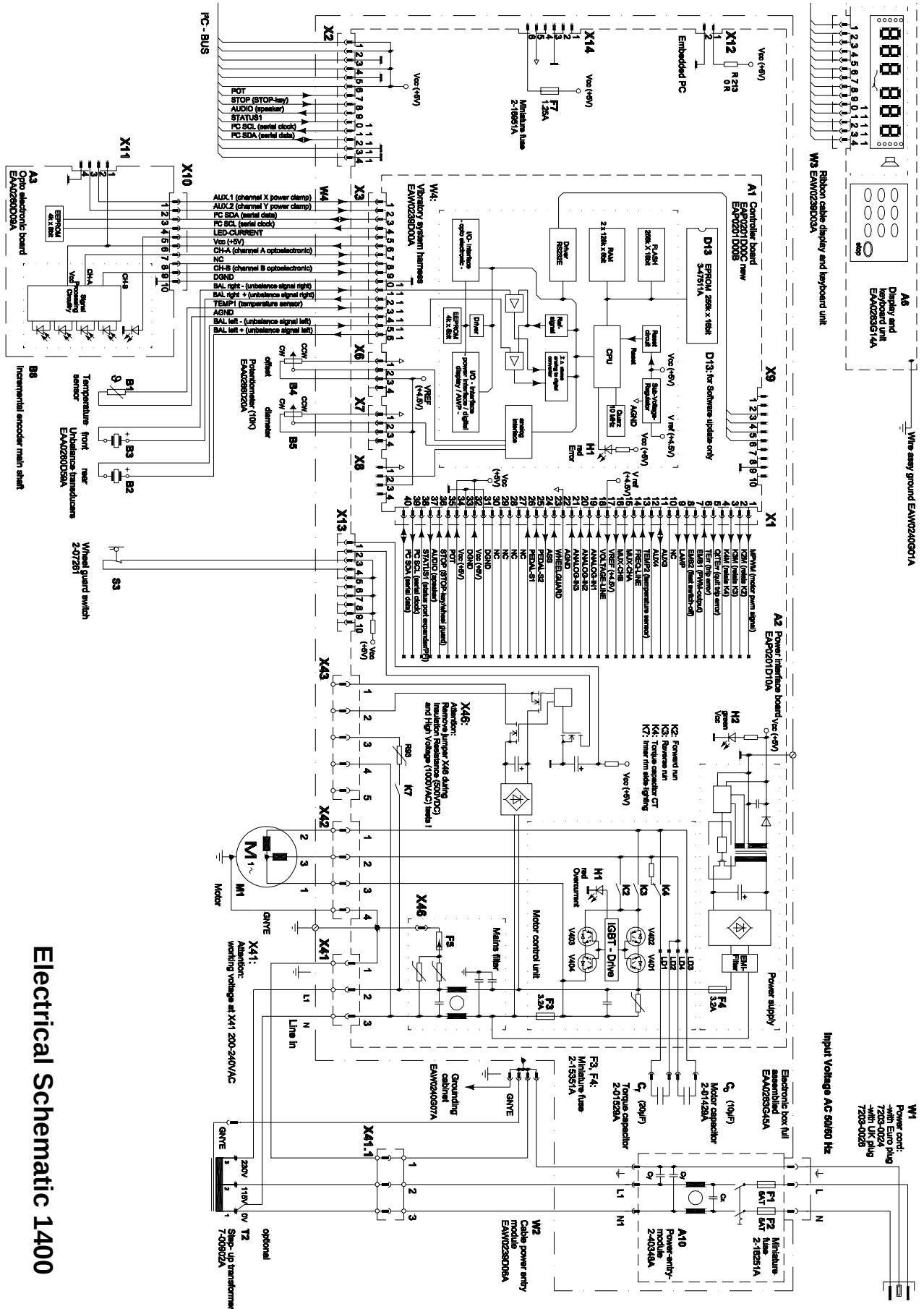
X8 - Width SAPE

- Pin 1=Gnd
- Pin 2=Output
- Pin 3=5 VDC

X9 - Not Used





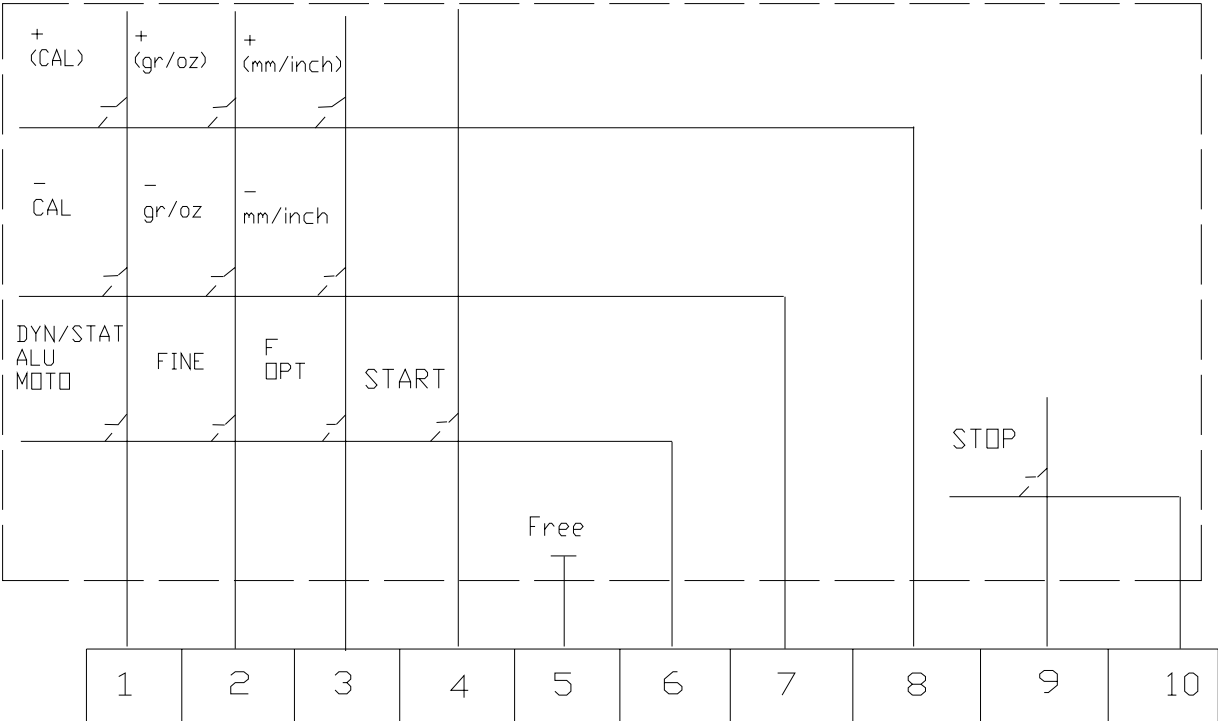


Electrical Schematic 1400

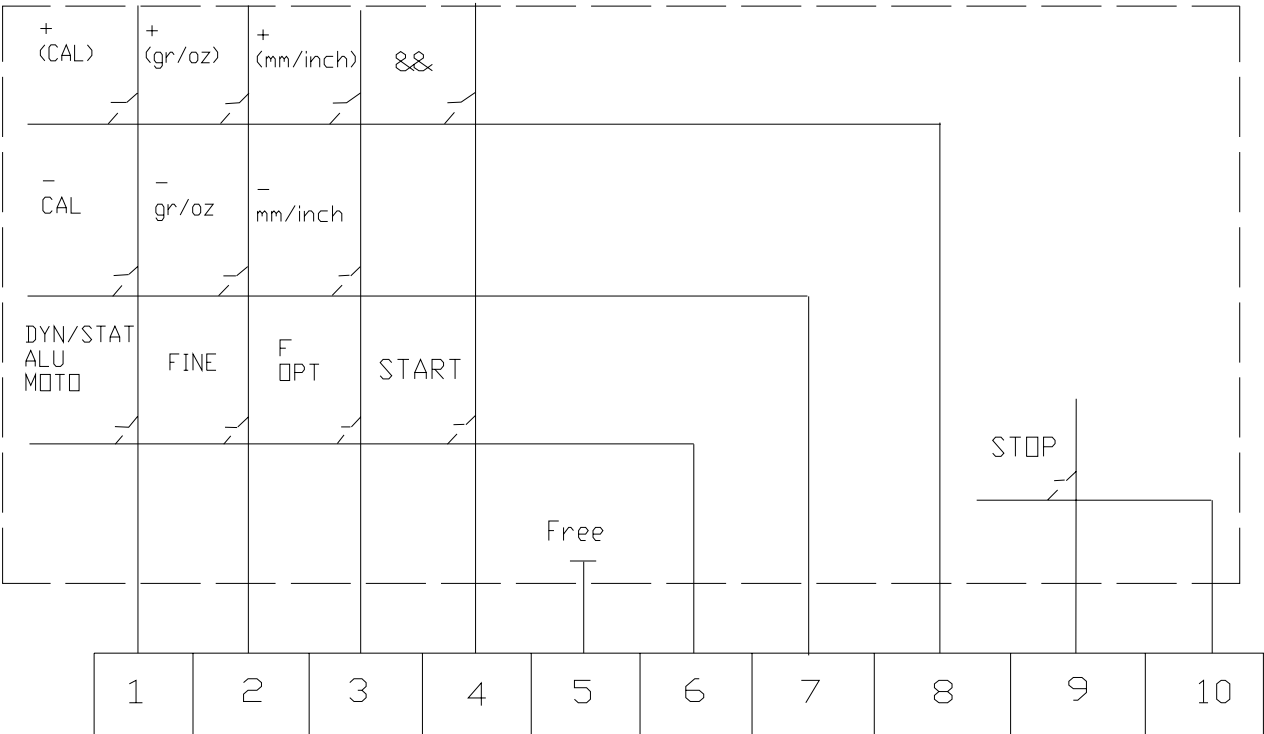


Electrical Schematic 1500

KEYPAD SCHEMATIC 1200 & 1400



KEYPAD SCHEMATIC 1500



[illegible]

CHAPTER 2

THEORY OF OPERATION

FUNCTIONAL DESCRIPTION

The AccuTurn Wheel balancers are designed to compute static and dynamic imbalance of car, light truck, motorcycle and truck wheels.

Wheels are attached to the shaft using precision centering adapters and retainers. The shaft rotates on precision bearings on the shaft support. The rotating shaft is perfectly balanced. The wheels attached normally represent an imbalance, which creates centrifugal force and a dynamic momentum as it is spun on the balancer shaft. The wheel is spun by means of a low RPM motor.

The centrifugal forces created by any imbalance are detected by the two transducers located between the shaft support and the machine frame. These transducers contain small discs of special quartz which generate millivolts of electric current when compressed. The current created is linearly proportional to the compression force.

Centrifugal force vectors are generated by imbalances in the rotating wheel. This causes a signal to be generated by the transducers (which pick up only the vertical component of the constrained forces) in the form of a periodic sine wave.

The signal is not perfectly sinusoidal, due to noises from in the suspension system, which add to the signal generated by the imbalance of the wheel. To determine actual imbalance the signal must be filtered.

To compute correct imbalance values, the parameters (diameter, width, and offset) of the wheel to be balanced must be entered. Enter wheel parameters using the Distance Entry Arm. Slide the gauge to touch the rim and hold. The distance to the rim and the wheel diameter are entered automatically by means of two mounted potentiometers (1400 & 1500). The rim width can be done automatically by simply pulling the width arm and touching the outside of the rim (1500). The rim width may also be done manually by using the supplied rim width calipers and entering the measured value. This is done by pressing and releasing the rim width button and toggling the $\pm$ keys on the display panel or by rotating the tire and wheel assembly until the desired number is shown.

To find wheel imbalance, the transducers signal magnitude and encoder timing are both required. A series of timing marks on the shaft that interrupt light transmitted between two optocouplers generate a DC Square wave each time a mark moves past an optocoupler. One additional mark offset from the encoders' metallic strip, interrupts a third optocoupler on the board, creating a zero-signal reset or home position. The encoder detects 512 angular positions during each turn of the shaft, plus the home or reset position. The frequency of the DC square wave generated by the encoder allows the balancer to compute shaft speed, wheel acceleration and weight location. The encoder and transducer signals are multiplexed by the CPU to give weight amount and location readings.

The CPU board gathers the information generated from the encoder and transducer via a ribbon cable. This board is powered with 5 VDC received from the Power Supply Board.

Calculated imbalance values are then shown on the LED display panel after a spin cycle.

BALANCER COMPONENTS

ELECTRONIC POWER BOX

The Electronic Power Box is positioned at the rear of a motor spin balancer. It contains a Power Entry Module, the Power Interface Board, the Motor Capacitors (not shown in the picture below) and the CPU. The main function of the retrofit Box is to allow easy retrieval and exchange of the electronic hardware to reduce servicing efforts. Therefore the electronic hardware is as much integrated into this Box as possible. On the retrofit Box is the central earth terminal that ensures the Permanent Ground.

Power Entry Module (PEM)

The Power Entry Module receives the power cord and relays the power, via a transformer if necessary, to the Power Interface Board, connector X41. The Power Entry Module (PEM) consists of one unit that accepts the power cord, suppresses noise and contains the fuses and the mains switch. Each balancer is protected by 2 fuses. The (power) LEDs do not light nor the green LED on the Power Interface Board. If a transformer is required, it is to be connected between the PEM and the Power Interface Board, Connector X41.

NOTE: IF ONE OF THE FUSES IN THE PEM IS BLOWN, THE BALANCER WILL NOT WORK.

Fuses & capacitor

In the retrofit box we have two capacitors:

- C1: is used for the spin;
- C2: is used for the works phase, while the wheel is turning over the shaft.

In case we hear any noise coming from the motor during this operation, the cause could be one of the capacitors; they get discharge automatically.

The protection over the power interface board is done by five fuses:

- F1 & F2: are placed in the entry module to protect the complete circuit against the over tension in entrance.
- F3 & F4: are placed in the motor control unit (a part of the power interface board) to protect the circuit in case of wrong tension generate from the transformer.
- F7: protects the connector x 12 in case of video board balancer.

Power Interface Board:

The function of this module is to accept the CPU controller board, that will be mounted onto it. It processes the input power and distribute that to the relevant peripherals it also exchanges input signals to output signals to peripherals. The Peripherals are: motor, Digital Display Board, switches, electro-magnetic brake, inner rim side light, electromagnet for the wheel clamping device, etc. A malfunction in this module can generate an error code that belongs to a component that is correct in itself.

MAIN PROCESSOR PCB

The microcontroller normally takes its instructions from the FLASH memory. A 40-pin IC socket is used to transfer the program from an EPROM to FLASH memory. Unlike EPROMs, FLASH memories do not require windows for UV light in order to delete data - they can be cleared and programmed electronically. Unless otherwise stated in the program revisions, new program versions can be installed without the need for adjustment. The main processor receives its power from the power supply pcb and distributes the power to the encoder, transducers and SAPE potentiometers. Calibration factors are stored in this location along with the encoder PCB.

KEYPAD

The keypad is used to input data into the Display PCB. It connects directly to the display pcb via a ribbon cable.

DISPLAY PCB

The Display PCB receives power directly from the power supply pcb. It passes 5VDC to power the tone generator and the LED display. It receives the information from the Main Processor Board via the power supply pcb. This information is passed back to the Main Processor routed through the Power Supply Board.

TEMPERATURE SENSOR

The system has a new force guidance structure (patent pending). The forces at the measuring transducers have been reduced, thus achieving long-term stability and high measuring accuracy. Pre-tensioning of the transducers is achieved by two leaf springs. On the vibratory system the measuring transducers are very close together so that the difference in temperature has only a slight effect. The current vibratory sensor has a temperature sensor. The transducers can therefore be measured by **one** temperature sensor and taken into account in a fraction of a second. The temperature sensor is attached to the vibratory plate by means of a U-shaped spring. This temperature sensor effects the transducers and is set during calibration.

DRIVE MOTOR

The drive unit is mounted directly to the vibratory system by means of (4) bolts. Three of the mounting holes are slotted, these are used for setting the tension on the drive belt. The drive belt is used to drive a large pulley which is mounted directly to the drive shaft of the vibratory system.

TRANSDUCERS

The transducers are installed in a manner that they form a virtual transducer on each end of the shaft. This gives the balancer greater accuracy along with minimal amount of erroneous readings. Both measuring transducers are arranged in one plane. The **rear** transducer picks up the alternating forces of the left-hand virtual measuring plane and is supported on the machine housing. The **front** measuring transducer is clamped between the vibratory tube and vibratory plate and transforms the alternating forces of the right-hand virtual plane into electrical signals.

SAPE (SEMI-AUTOMATIC-PARAMETER-ENTRY)

2 Window Display

If the distance gauge fails, the machine displays an **Error Code** when the machine is powered on. Checks should be made to make sure the SAPE's are in their HOME position during start up. The operator needs to press the **STOP** button to exit the display and enter idle state. The machine masks the function of the failed part after SAPE check. For example, if the diameter gauge fails, the machine disables the measurement of diameter and measures the distance only. Or if the distance gauge fails the machine disables the measurement of the distance gauge and measures the diameter only.

The potentiometers plug into the main processor at connection X6 (Distance) and X7 (Diameter) and X8 (Width). The potentiometers are supplied with 5VDC from the Processor Board. As the SAPE is pulled out and up towards the wheel the voltage(s) change. The distance from the balancer to the wheel is generated from the voltage output and the diameter of the wheel is generated from the amount of voltage output when the arm is moved up. Adjustment are made using the C80, C82 code, this procedure can be found later in this manual.

ENCODER

The encoder disk is built onto the shaft. It cannot be adjusted and can only be replaced by replacing the vibratory member. The new incremental encoder is fitted in the vibratory tube and consists of a reflective slotted sleeve which is mounted on the main shaft and the optoelectronic unit. To prevent dirt and light entering, the opening in the vibratory tube must be sealed with black adhesive tape. A red visible LED and four light detectors are fitted in the encoder part of the optoelectronic unit behind the lenses. Part of the light is reflected back from the webs of the slotted sleeve to the encoder part and focussed by the lens, such that the web-slot pattern of the sleeve is mapped on the four light detectors. Two light detectors are connected to one amplifier in the encoder part. The difference in brightness between the detector pairs determines the instantaneous output states of channels A and B. To exclude interference from extraneous signals and to guarantee reliability the two signals are amplified by an IC. One slot in the sleeve is wider than the other 255 slots. Therefore the absolute angular position of the main shaft can be determined at constant rotating speed. The

surface of the slotted sleeve must be clean and shiny, the slots must have a dull black background. Should a dirt particle have settled on a web or in a slot, it can be lifted off of the slotted sleeve with self-adhesive tape by applying it onto a strip of strong paper so that half of the tape is on the paper and the other half overhanging. **CAUTION!** If the slotted sleeve is twisted relative to the main shaft when being cleaned, the step compensation of residual shaft unbalance must be performed with C84. A defective slotted sleeve cannot be replaced in the field because the ball bearings of the main shaft are pressed in. The incremental encoder can be checked with test functions C74. The calibration factors are stored in this location along with the Main PCB.

VIBRATORY SYSTEM

The vibratory member is the foundation of the balancer. It houses the encoder and transducers along with a temperature sensor for the transducers.

CHAPTER 3

CHECKOUT, CALIBRATION AND MAINTENANCE

GENERAL

This chapter incorporates checkout, calibration and maintenance of all three Accuturn balancers. The test codes for each digital display balancer are alike, and so are the results however some test will not be available with the 1200 or the 1400 . The Accuturn balancers use "F" key to begin any service procedure.

WHEEL SPIN FUNCTIONALITY

A wheel spin can be started when the machine is idle, when data is being entered manually and during user calibration, minimisation and some service codes. When the wheel starts to spin the display is cleared of all data and a tone is generated. When the measuring run is completed successfully a tone is generated and the results are displayed, and the weight placement bar graph(s) are enabled.

Errors which can be generated during a measuring run are as follows;

- E10 SAPE out
- E22 Speedup timeout
- E23 Speed not reached
- E24 Speed low
- E26 No Acceleration
- E27 Slip Detected
- E28 Stop by raising wheel guard
- E29 START pressed while hood up.

If one of the above errors is displayed the spin is aborted, the brake is applied and the balancer returns to the idle state. If the wheel rotates in the wrong direction above a preset speed "E25 reverse error" is generated. This error resets when the speed is reduced to a near stop.

BALANCING WITHOUT SLIP CHECK

Usually a balancing run is always with slip check to avoid a balancing run with loose wheel (in case machine display E27). "Balancing without slip check" is a special function used to balance light wheels. To use this function the operator must press and hold the <START> key more than 3 seconds (otherwise normal balance is started)

SHAFT IMBALANCE, WHEEL ADAPTER TO SHAFT REMOUNT TEST

This test proves the wheel balancer centering device is balanced, turns true and proves the centering device inside taper and balancer shaft outside taper (mating surfaces) are true.

1. Mount a medium size wheel assembly (14"), input the rim dimensions and balance the wheel assembly to 0.00 ounces imbalance in both planes. This must be fine balanced to exactly 0.05 in both planes.
2. Spin the balancer several times. Verify that no more than 0.05 oz. imbalance is displayed.
3. Loosen the Speed nut and rotate the tire and wheel assembly 180 degrees, making sure the cone does not rotate. **NOTE: DO NOT REMOVE THE WHEEL ASSEMBLY.**
4. Operate the balancer. The new imbalance displayed should not exceed 0.25 oz.

TEST PRODUCES READINGS OUT OF TOLERANCE:

5. Remove the tire and wheel assembly from the balancer.

6. Check the tapered surfaces of the basic centering device and balancer shaft. They should be clean and smooth. Clean and retest. Check all mounting accessories cones, wingnut etc. making sure each fit on the shaft snug, there should be no play between the shaft and mounting accessories.
7. If the test still produces unacceptable results use a dial indicator, measure runout of the balancer shaft tapered mounting surface. Acceptable tolerance is 0.0015" T.I.R. (Total Indicated Runout). If the surface measures out of tolerance, replace the vibratory system.
8. Perform a C80 (1400-1500), C82 (1500 only), C83,C84,C88 and retest. These test can be found later in this Chapter.

BALANCER DIAGNOSTICS (TROUBLESHOOTING)

Many problems may be found by process of elimination. By determining the problem, then eliminating potential problem areas starting with the *most-likely to fail* items, solutions to problems may be rapidly found. The balancer is composed of subsystems, each requiring several inputs for proper function. With proper inputs the subsystem performs as expected and produces an output. Every piece of equipment, when operable, functions in a predetermined manner. Events have to take place in the proper sequence every time. A balancer must:

- Be supplied with correct power and ground.
- Give a display output.
- Accept Keypad input.
- Process commands through the Computer.
- Receive and process encoder/transducer inputs.
- Brake
- Display proper weight amount and location.

The technician should watch a machine work and make performance assessments based on what is seen. If subsystem failure is suspected, use diagnostic tests to confirm the failure. Remember, every part requires input to produce the expected output. These outputs in turn become inputs for further use by the system.

TROUBLESHOOT USING CORRECT DIAGNOSTICS PROCEDURES

Balancers are relatively simple pieces of machinery. With proper diagnostic procedures, balancer problems should be quickly resolved. The Basics that the technician must *never* overlook are:

1. AC Power. The unit must be supplied with correct AC power.
2. Ground. These machines depend on proper Grounding for proper and safe function. Improper or poor ground will create problems that are quite difficult to diagnose, *and may create a dangerous condition*. Check, never *assume* ground is correct!
3. DC Power. The microprocessor will not run correctly (if at all) if it is not supplied with proper DC power and ground. Check DC power for ripple or drift (may indicate faulty regulation or failing PCB's). Ensure there is *enough* power and a good ground.
4. Inputs. Check for proper Encoder and Transducer signals.
5. Output - Once all voltages and signal levels are present a proper output can be expected.

TOOLS REQUIRED WHEN SERVICING THE ACCU BALANCERS

Tools

Metric Sockets (4mm Thru 15mm)

Metric Wrenches (6mm Thru 15mm)

Assorted Hex Wrenches metric / standard

Inch Pound Torque Wrench

Foot Pound Torque Wrench

#2 Phillips Screwdriver

#2 Flat Head Screwdriver

Digital Volt-ohm Meter

Small Screwdriver

Hammer drill (Installation Option)

Pruefroter (see below) #H6416946 or A fine balanced tire/wheel assembly.

3.50 ounce (100gr) wheel weight

Program EPROM #0026603

Loctite #242 and #272 or #609

Silicone based grease - Used for transducer ball placement

Putty for fine wheel balancing.

1, 2 and 3 ounce weights verified accurate (weigh on postal scales and trim to exact weight - paint and label)

In the event of vibratory system replacement, the use of a certified Pruefroter (Figure 3-1) will be required to confirm conformance to design specifications and certification requirements.

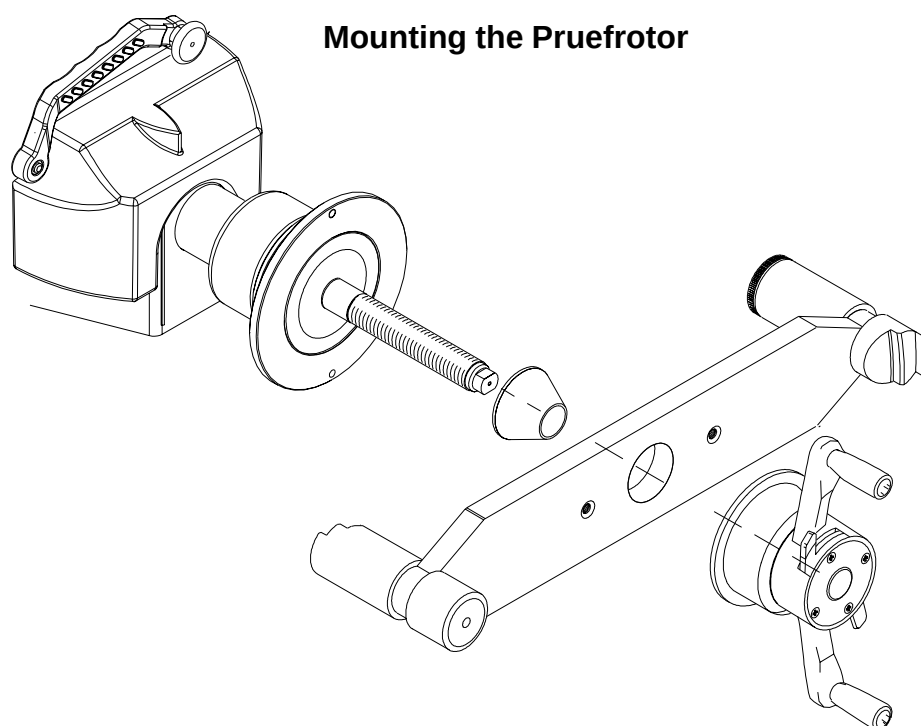
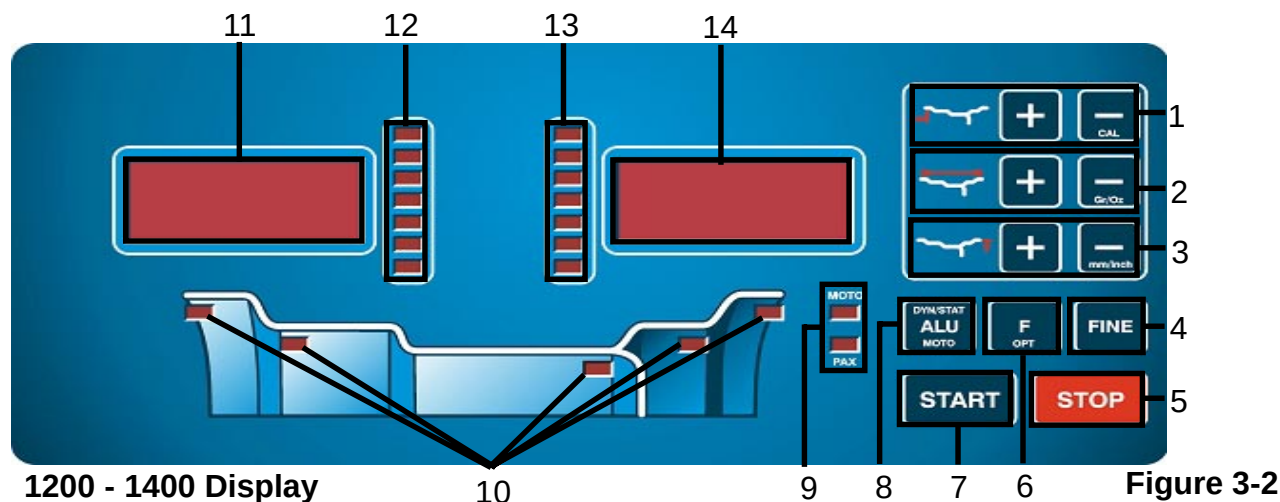


Figure 3-1

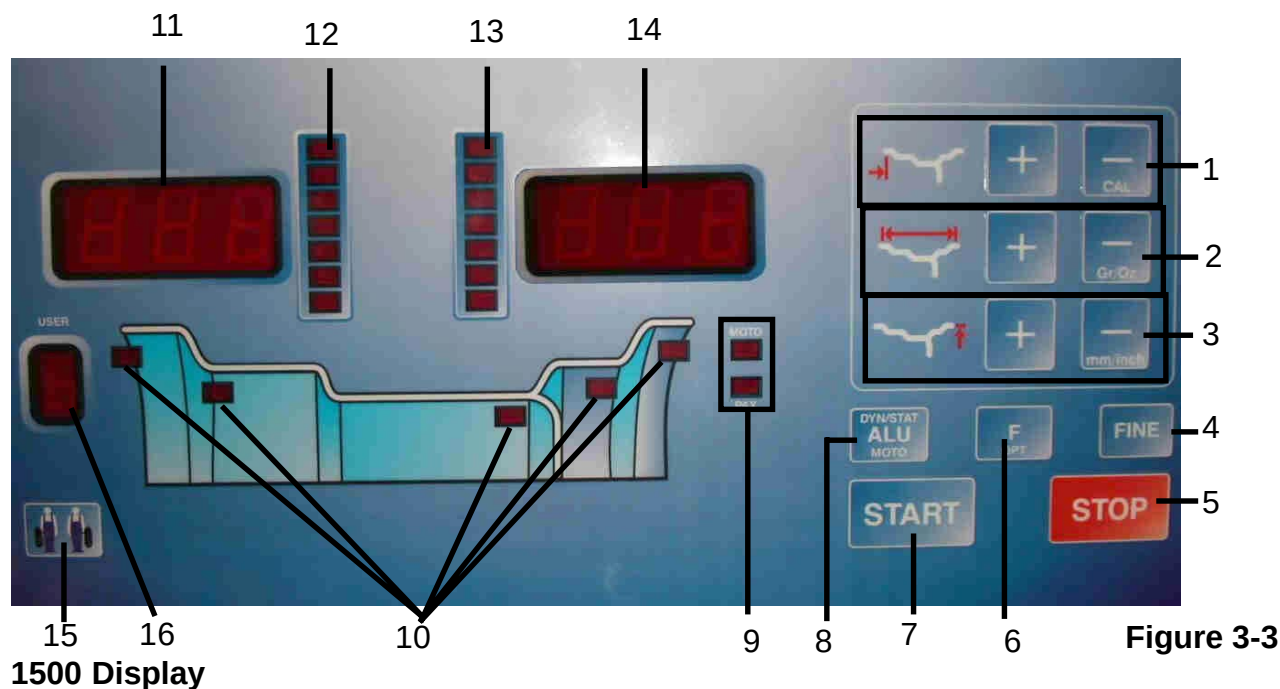
DEFINITION OF TERMS

1100 (NOT RELEASED)	Hand-spin wheel balancer model designation
1200	Entry level motorised (low-digital) wheel balancer model designator (2 User)
1400	Mid Digital motorised wheel balancer model designator (4 User).
1401 (NOT RELEASED)	Mid Digital motorised wheel balancer model designator with 3D SAPE (4 User).
1500	High Digital motorised wheel balancer model designator with 3D SAPE (9 User)
NORMAL	A weight placement mode typically used for steel wheel rims. Two clip on weights are attached. One on either rim flange.
TRUCK ROUND	A weight placement mode typically used for truck wheel rims. Two clip on weights are attached. One on either rim flange. Displayed unbalance round in 10 g or 0.5 oz.
ALU	A weight placement mode typically used for alloy wheel rims. Two stick on weights are attached in a variety of possible locations.
STATIC	A weight placement mode typically used for motorcycle wheel rims.
HWM	Hidden Weight Mode (HWM) is a special ALU mode which allows the operator to enter the weight offsets exactly, thereby providing more accurate ALU mode balancing.
SWM	Split Weight Mode (SWM) is a special function which allows the operator to split the weight at position 3 when using HWM (a hidden weight mode described below). This function allows the "hiding" of weights behind wheel spokes.
Rim Data	Rim data refers to the nominal wheel rim dimensions; offset, rim width and rim diameter.
SAPE / Gauge Arm	These terms refer to the arm used to automatically enter offset and/or diameter, and apply weights in HWM modes.
C88 Offset	This is a small offset (0 – 5 degrees) to the weight application position for clip on weights and stick on weights in modes other than hwm1, which ensures that the weight application position is at exactly the 12 o'clock position. It is produced by a service function.
Gauge arm offset	This is a large offset (10 – 30 degrees for example) to the weight application position which is used internally by the machine when stick on weights are to be applied with the gauge arm. It is rim diameter dependent.

INPUT KEYS / DISPLAY WINDOWS



1. OFFSET + OFFSET - (CAL)
2. WIDTH + WIDTH - (GR/OZ)
3. DIAMETER + DIAMETER - (MM/INCH)
4. FINE / EXIT
5. STOP
6. F (OPT)
7. START
8. ALU (DYN/STAT, MOTO)
9. MOTO / PAX INDICATOR LIGHTS
10. WEIGHT PLACEMENT INDICATORS
11. INSIDE WEIGHT AMOUNT / FUNCTION DISPLAY
12. INSIDE WEIGHT LOCATION
13. OUTSIDE WEIGHT LOCATION
14. OUTSIDE WEIGHT AMOUNT / FUNCTION DISPLAY
15. OPERATOR KEY
16. OPERATOR INDICATOR



GENERAL OPERATION

Pressing the relevant key performs that action. Pressing the **OFFSET +** key increases offset. Pressing the **WIDTH +** key increases rim width. Pressing the **DIAMETER +** key increases rim diameter. To access secondary functions the machine should be in Idle state, press the **F** key and the specific key. Pressing **F** while pressing the **DIAMETER – (MM/INCH)** key will toggle the MM and INCH display modes. The F key on its own is mostly used as the “**ENTER**” key. The FINE key is mostly used as the CANCEL Key.

MANUAL DATA ENTRY

The nominal rim dimensions of the wheel can be entered by using the parameter entry keys. These can only be used when the balancer is idle. To enter a value press the appropriate key. The current value will be displayed (offset in left panel, diameter and width in right panel). Enter the value using the named keys. The value can be stored and the function exited by performing any of the following actions;

Starting a wheel spin (see below).

Pressing the “**F**” key or the dimension key which is in use.

Only Diameter can be entered while in a hidden weight mode (width and offset are not required, weight offsets are entered with the sape). The rim diameter range in HWM (Hidden Weight Mode) mode is reduced due to the mechanical constraints of using the gauge arm to apply the weights. For this reason, HWM modes will only allow results to be displayed if the rim diameter is within range.

Value limits are:

Width	80 - 510 mm or 3 - 20 inches.
Diameter	205 - 762 mm or 8 - 30 inches in non-HWM modes. 12 – 25 inches in HWM 1 or HWM 2 modes with inches selected. 320 - 520 mm (PAX mode or HWM 1 and mm's selected). 305 – 635 mm in HWM2 with mm selected.
Offset	1 - 500 mm.

Increments are:

- Inch 0.25 or 0.5 depending on size of value (0.25 below 10.0)
- MM 1 except for diameter in HWM 1 where increment is 20 (PAX increments).

SAPE OPERATION

There is no automatic SAPE operation for the model 1200.

The SAPE on the Model 1400 and 1500 can be used for both data entry and weight application. Machines fitted with a 2D SAPE allow the automatic entry of offset and Diameter. During a non-hwm weight application mode (anything but HWM1 and HWM 2) removing the sape from the home position causes any results displayed to be removed from the display. If the SAPE is removed while in manual data entry mode the data entry function is first exited (see above) and then the SAPE becomes functional as detailed below. When the SAPE is returned to the home position the mode of entry automatically goes to parameter entry. If the SAPE is removed while a measuring run is in progress the run will be terminated, a beep will sound, the wheel will brake and “E10” is displayed. After 7 seconds E10 is cleared. If an attempt is made to use the SAPE while in another mode of operation the SAPE does not interrupt the function in use. When the function is exited by the user the SAPE becomes active. In the HWM mode 1 or 2 there are two modes of SAPE operation, data entry and weight application. Data entry is the default mode of operation when HWM 1 is entered. When valid results are made available (see recalculation above) weight application is enabled. Weight application is disabled by pressing the <**STOP**> key and removing the SAPE from the home position with machine in idle mode a tone is generated.

NON HWM SAPE DATA ENTRY

If the SAPE is held stationary for 1 second or more a tone is generated and the offset is shown in the left display panel and the diameter in the right. Holding the SAPE stationary in another location for 1 second or more will cause another tone to be generated, and a new value to be displayed and stored. The value is removed from the display when the SAPE is returned to the home position. If a measuring run has been performed the results are recalculated and displayed when the SAPE is returned to the home position. The rim data values will show in the display after measuring.

HWM SAPE DATA ENTRY

The HWM data entry mode is entered by removing the SAPE. When the SAPE is removed from the home position the appropriate inner plane weight led blinks. This shows the operator where to apply the arm to the rim. After the SAPE is stationary for 1 second a tone is generated, the inner plane position is stored and the outer plane led blinks. At this point the SAPE can be returned to the home position. If this is done, the results are not recalculated as the user has only partly entered the required parameters with the SAPE. If the SAPE is removed again from the home position, the outer plane led will flash and the user must enter this value. Holding the SAPE stationary for 1 second causes the value to be entered, a beep to be generated and the led to stop flashing. The SAPE must now be returned to the home position. If a measuring run has been performed and the rim diameter is within limits for HWM the results are recalculated and displayed when the SAPE is returned to the home position. If the rim diameter is less than 12 inches "E12" will be displayed. This is done because it is not possible to apply weight to the wheel using HWM modes with a rim diameter of less than 12 inches. Pressing the diameter entry key will automatically increase the diameter to the minimum required value for the HWM mode.

After the input of rim data by using SAPE,

- if no measuring run was done before the data input, machine will go idle or wait for data input;
- if a measuring run was completed before the data input, the unbalance will be recalculated and displayed.

NOTE: THE INNER AND OUTER PLANES MUST BE SEPARATED BY 3 INCHES OR MORE. HOLDING THE SAPE STATIONARY IN AN ATTEMPT TO ENTER AN OUTER PLANE OFFSET LESS THAN 3 INCHES FROM THE INNER PLANE WILL NOT STORE THE PLANE OFFSET.

SAPE WEIGHT APPLICATION

When valid results become available in a hwm mode, the SAPE is configured for weight application. When the SAPE is now moved from the home position the SAPE position is checked against the stored offset positions. The SAPE arm is used to apply stick on weights only. If a stick on weight is required for a plane, and the value of the weight is above the threshold, rotate the wheel so that the full application LED is lit for that plane. By moving the SAPE the right led will display a minus distance value to the inner correction's plane if the SAPE is less than 100 mm left from the inner plane. The machine will sound a tone when the SAPE arm is moved to within +/-1.0 mm of the weight position. While the SAPE is in this position the appropriate weight LED will flash and 0 will be displayed. Moving out of this position will stop the LED from flashing and a plus distance will be displayed. This procedure is also used by weight application for outer plane. Application mode can be cancelled by pressing the offset $\pm$ or diameter $\pm$ key when the SAPE is in the home position.

3D SAPE (1500 ONLY)

If the 3D SAPE was used before the 2D SAPE to measure the rim data, the rim width would be calculated and saved, after which the left LED would flash and wait for data from the 2D SAPE. After that the rim width will be recalculated and saved. This would also be done if the 2D SAPE was used first. Pressing the STOP key would terminate an incomplete data input.

SERVICE CODES

There are only two service codes that are accessible in a “Users Mode”. These are C4 (Unbalance Compensation) and C12 (Display Counter Indication). To access these service code in “Users Mode”:

1. Press the <F> and the <FINE> key for 3 seconds, “SEL ECT” will be displayed for 2 seconds and then “BAL SHT” will be displayed (Indicating C4)
2. Press the plus or minus key “Count” (C12) will be displayed and then changed between C12 and C4.
3. Press the <F> key to select the displayed item.
4. To exit the C4 or C12 function press the <FINE> or the <STOP> key.

NOTE: THESE PROCEDURES ARE THE SAME AS BEING IN THE “SERVICE MODE”.
NOTE: ONCE THE UNIT IS POWERED DOWN THE VALUES FOR C4 WILL BE GONE.

ACCESSING THE SERVICE CODES

NOTE: IF A SERVICE CODE IS TO BE ACCESSED WHICH WILL REQUIRE THE USE OF THE PRUEFROTOR OR A WHEEL AND TIRE, IT MUST BE MOUNTED AND PROPER DIMENSIONS ENTERED BEFORE TURNING THE BALANCER OFF TO ENTER THE SERVICE PROGRAM.

With the unit in the “OFF” position press and hold the <FINE> and the <CAL> buttons simultaneously and switch the power to the “ON” position. After approximately 7 to 8 seconds the unit will sound a tone and the display will go blank and then display “CAL FAC”, release the keys at this time. The display will then show “DIS 115” at which time the technician should press the <F> button. Failure to press the “F” button within 5 seconds will abort the service entry procedure and the technician must start from the beginning.

The first service code to appear is C4. Press the Distance <±> key to the desired service code, once the desired code is displayed press the <F> key to activate that service code. After the service code is performed the technician will either press the <F> button to store the data or the <STOP> button to exit the code and enter into another service code or press the <FINE> key to exit the service menu. If the “FINE” key is pressed at any time the technician must re-enter in the service menu from the beginning.

C CODE DESCRIPTIONS

C4 UNBALANCE COMPENSATION (ALL MODELS)

“C4” in left display, “0” or “1” in right display. Factory setting is “0”.

- Spin wheel to compensate for adapter unbalance.

Lower the hood to commence a spin. After the spin is complete the machine will store the new compensation values and exit to the service menu. C4 is then active (independent from the choice 0 or 1).

- If C4 is already active when the service code is selected, the “+ - Keys” will toggle the status of the code between 0 and 1. Pressing the <FINE> with 0 displayed cancels the code and if 1 is displayed the code remains active still. Press the <FINE> key exits the code.

C7 VOLUME AND AUDIBLE TONES

“C7” in left display, “10” - “100” in right display. Factory setting is “50”.

Select the required volume using the <±> keys. Press the <F> to confirm the value.

Pressing the <FINE> key at any stage will act like an Escape key and exit the code without changing anything.

C11 STOP AT TOP (ONLY 1400 AND 1500)

“C11” in left display, current setting is in right display (1 = Yes, 0 = No, Factory setting is “1”).

- Press <±> key to change between 1 and 0.
- Press the <F> key to accept the displayed item and exit the code.
- Press the <FINE> key to exit the code without any change.

C12 COUNTER INDICATION

A 6-digit number is displayed across both displays (0 – 999,999). This number indicates the total number of measurement runs performed.

Pressing the **<±>** keys displays another counter. The five counters that are available:

- C1: Total for all spins
 - C2: Spins with OK
 - C3: Spins with Optimisation / Minimisation
 - C4: Spins in service mode
 - C5: Spins since last calibration
- Pressing the **<FINE>** Key will exit the code

C14 USER CALIBRATION

When doing a User Calibration it is not necessary to use a tire and wheel assembly. Use factory Calibration Weight supplied with the balancer.

1. Turn balancer **OFF**. Enter in the calibration mode by holding down the “**CAL**” key 7 seconds and restarting the machine. Hold the key until the display flashes “**Cal Usr**”.
2. Press and hold **CAL** button, then turn balancer ON.
3. After approximately seven seconds “**CAL USR**” will flash on the display followed by “**dis 115**”. Release **CAL** button.
4. Press **F-OPT** button and the number one (1) will be displayed on right LED. Lower wheel guard and spin shaft assembly with no wheel, adapters or wing nut on shaft. (Figure 3-4)
5. When rotation stops, the number two (2) will be displayed on right LED. Lift wheel guard and, using the threaded hole, attach factory Calibration Weight on inside of flange plate, (Figure 3-5)
6. Lower wheel guard and spin shaft assembly. After the shaft stops, display will be blank for about 4 seconds then **DNE** will be displayed. Remove Calibration Weight and place in holder. Turn balancer off and back on. Balance tire and wheel assembly to check for proper operation.

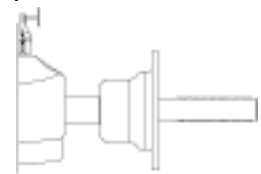


Figure 3-4

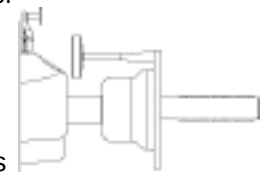


Figure 3-5

Possible messages during calibration;

- E6 Calibration tool was not attached in both runs, calibration tool was attached in both runs
- E16 Calibration weight attached erroneously to flange
- E50 Factory calibration was not completed.
- E51 Calibration failed.
- E52 Calibration weight on opposite side to factory calibration.

Any operator wheel spin errors occurring during user calibration or minimisation cause the functions to exit.

C15 STICKY AT TOP (ONLY 1400, 1500)

“C15” in left display, current setting is in right display (1 = Yes, 0 = No, Factory setting is “1”).

- Press **<±>** key to change between 1 and 0.
- Press the **<F>** key to accept the displayed item and exit the code.
- Press the **<FINE>** key to exit the code without any change.

C28 LAST 10 KERNEL ERROR MESSAGES

A 6 hex-digit error number is displayed across both displays. At two second intervals this number is switched

with a number from 1 – 10 (1 being the most recent) indicating which error message is currently displayed.

- Pressing the <±> key cycles through the list of error codes.
- Pressing the <FINE> Key will exit the code
- Pressing the <F> key exits the code.

C43 RESET SPIN COUNTERS

“C43” in left display, “0” or “1” in right display. 0 will do nothing, 1 resets all of the counters.

Pressing the <±> key will toggle the status of the code between 0 and 1. Pressing <F> with “0” displayed exits the code without resetting the counters. If “1” is displayed and <F> is held down for 10 seconds the code is exited and the counters are reset. Pressing the <FINE> key at any stage will act like an Escape key and exit the code without changing anything.

C47 CONFIGURE THE FLASH

“1100” or “1200” “1400” “1401” and “1500” in displays.

Pressing the <±> keys will toggle the selected machine model. Pressing <F> will program the flash for the appropriate machine. The machine will then reset. Pressing the <FINE> key at any stage will act like an Escape key and exit the code without changing anything.

C66 - C67 ENGINEERING AND MANUFACTURING PURPOSES

C72 MECHANICAL PHASE SHIFT OF VIBRATORY SYSTEM

- Enter C72 by pressing the <±> keys; “1” will be displayed in the left window indicating the step number.
- Mount the Pruefrotor on the balancer and perform a measuring run. A number “2” will be displayed to indicate the step number. (Figure 3-6)

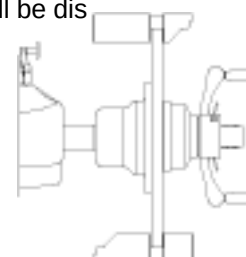


Figure 3-6

- Mount the calibration weight (100 gram) on the left side of the calibration rotor. Perform a measuring run. (Figure 3-7)
- The digit “3” in the left display to indicate the step number.

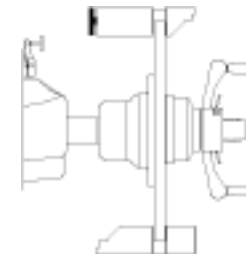


Figure 3-7

- Remove the calibration weight and mount the calibration weight on the right side of the calibration rotor. Perform a measuring run. (Figure 3-8)

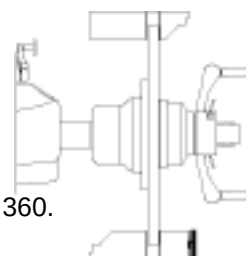


Figure 3-8

The phase shift of the left hand plane is shown as a floating point number in degrees from 0 – 360.

Pressing the <±> keys displays the phase shift of the right hand plane.

Pressing the <FINE> or <F> key will exit the code

C74 INDICATION OF POSITION COUNTER (ENCODER INSPECTION)

A 3 – 6 digit floating point number in degrees from 0 – 511. This represents the angular wheel position. If the wheel position subsystem is not initialised (possibly because the machine has just been turned on) a “buSY” indication is displayed until a value is available. Rotate the shaft one complete revolution to initialize the encoder. Pressing the <FINE> or <F> key will exit the code

C75 ENGINEERING AND MANUFACTURING PURPOSES**C76 INDICATION OF ALL ADAPTED VOLTAGES AFTER CALIBRATION WITH C83**

Press the <F> during the display of C76 adapted voltages will be displayed. Eight voltages are available. Press <±> to change the display. This could be requested for a check in case E24 or E27 is displayed in order for comparison to the below table.

LEFT DISPLAY	RIGHT DISPLAY	MEANING
L5b	42	low speed 50Hz bottom voltage
L5t	47	low speed 50Hz top voltage
H5b	49	high speed 50Hz bottom voltage
H5t	55	high speed 50Hz top voltage
L6b	48	low speed 60Hz bottom voltage
L6t	52	low speed 60Hz top voltage
H6b	60	high speed 60Hz bottom voltage
H6t	64	high speed 60Hz top voltage

Press the <FINE> key to exit the code.

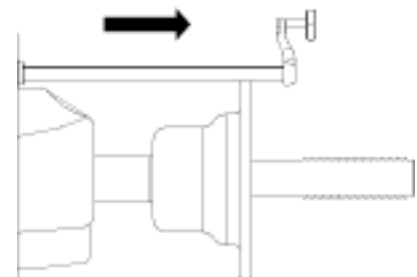
C80 2D SAPE ARM CALIBRATION

The Model 1200 does not have an automatic SAPE so it does not require any adjustments. Both the model 1400 and 1500 have an automatic SAPE that requires periodic adjustment and/or calibration.

After entering in the C80 calibration the display window will display a “1” in the left display and the raw SAPE voltage in the right hand display. The value should be $+4.30\text{VDC} \pm .10$ volts. If the value is not correct adjustment to the distance (offset) potentiometer must be adjusted. This can be done by removing the weight tray and with the SAPE rod in the home position, loosen the 10mm nut holding the wheel to the potentiometer and adjusting the potentiometer using a flat blade screw driver (Figure 3-9) Once the correct voltage has been obtained, securely tighten the 10mm nut and press the <F> key to store the value in the HOME position and continue. The display will change to “2”

**Figure 3-9**

Fully extend the distance gauge, the value cannot be any lower than $0 \pm .05$. Press the <F> key to store the fully extended value. (Figure 3-10)

**Figure 3-10**

Place the flat portion of the calibration weight against the face plate. Extend the SAPE and touch the tip to the calibration weight and rest the bottom portion of the weight applicator on the bell housing (Figure 3-11). The value should be $+3.57\text{VDC} \pm 0.05$ adjust the diameter potentiometer if the value is not correct adjust the diameter potentiometer.

Press the <F> key to store the value and proceed to the next step.

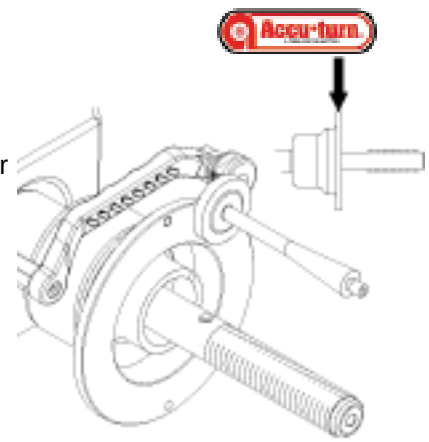


Figure 3-11

Place the large pancake portion of the calibration slug down on the bell housing and pull the distance arm out and rest it on the pancake portion of the calibration slug. Press the <F> key to store the value and proceed to the next step. (Figure 3-12)

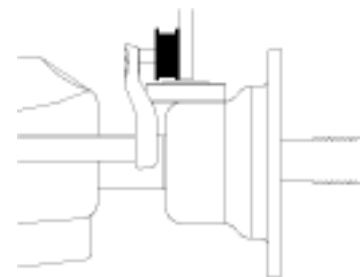


Figure 3-12

Place the SAPE on top of calibration slug weight by keeping the slug thread in the centre of the SAPE plastic round part (Figure 3-13). Press the F key and display will show C80 and enter the value.

CALIBRATION COMPLETE



Figure 3-13

C81 SAPE ARM ZERO

Place the flat portion of the calibration weight against the face of the flange plate. Extend the SAPE arm and touch the tip to the calibration weight. Press the <F> key to store the value (Figure 3-14).

CALIBRATION COMPLETE

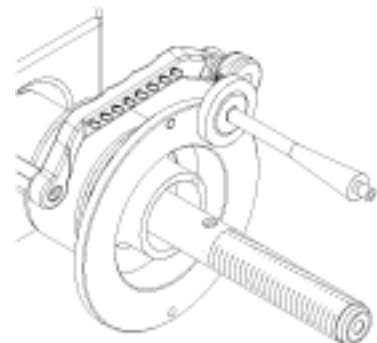
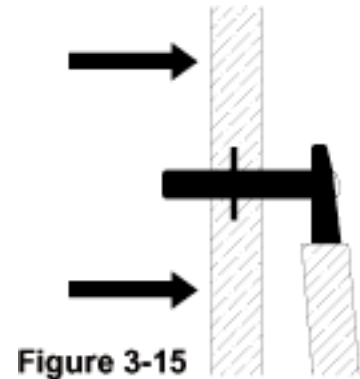


Figure 3-14

C82 3D SAPE CALIBRATION

The model 1500 is the only balancer that requires this procedure, both the 1200 and 1400 do not have the "Width Arm".

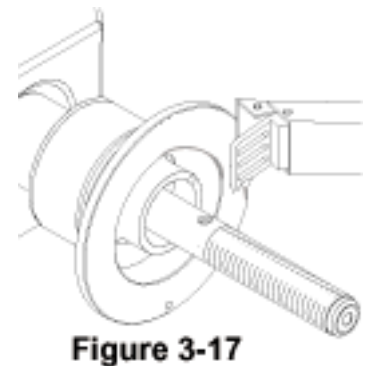
Make sure that the width arm is in the home position, (Figure 3-15) enter C82 and verify that the voltage reading from the SAPE is 4.25 - 4.30VPC. If the voltage is correct press the <F> key to enter the value, if it is incorrect adjustments must be made before continuing.



If the values are not correct adjustment to the 3D potentiometer must be made. Remove the three philip screws from the 3D SAPE potentiometer that is mounted on the wheel guard. Holding the SAPE arm in the home position adjust the potentiometer to correct voltage. (Figure 3-16)

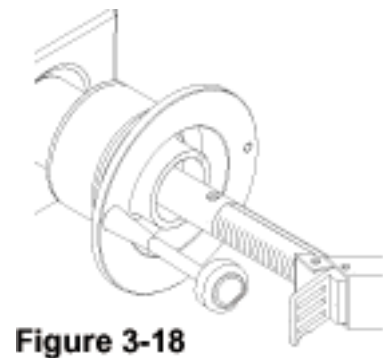


Move the SAPE arm and touch the tip to the Flange Plate (Figure 3-17) and press the <F> key to enter the value.



Screw the Calibration weight into the threaded hole on the Flange Plate and touch the tip of the 3D SAPE to the tip of the calibration weight (Figure 3-18) and press the <F> key to store the value.

CALIBRATION COMPLETE



C83 FACTORY CALIBRATION PROCEDURE

NOTE: THE C80 CALIBRATION MUST BE DONE BEFORE THIS OPERATION.

A balanced tire and wheel assembly can be substituted if a Pruefroter is not available. The calibration procedures are the same and can easily be performed. The correct dimensions of the Pruefroter or tire and wheel assembly must be entered before proceeding with this procedure. After the correct dimensions have been entered recycle the power using the procedures for entering into the service menu. This written procedure is done using the Pruefroter.

1. Enter C83 using the <±> keys and press the <F> key. Mount the Pruefroter on the balancer shaft and lower the wheel guard to perform a measuring run. (Figure 3-19)
2. After the first measuring run the display will change to "2" in the left display and "100" in the right display. If a tire and wheel assembly is used and a 100 gram weight (3.5oz) is not available, press the <±> keys until the exact weight in grams is displayed and press the <F> to accept this value. The display will change to "3".

NOTE: IF USING PRUEFROTOR, PRESS <F> AND GO TO STEP 3 BELOW.

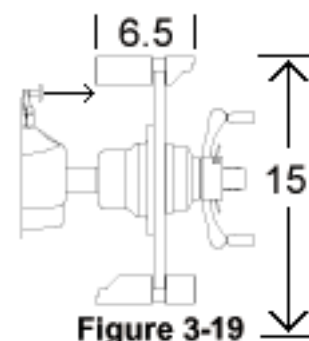


Figure 3-19

3. Screw the 100gram (3.5oz) weight on the left side of the Pruefroter (Figure 3-20) and lower the wheel guard to begin the measuring run. After the shaft comes to a stop the display will change to "4".

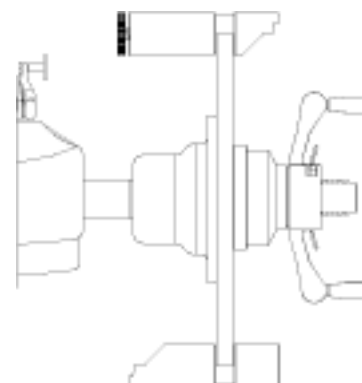


Figure 3-20

4. Remove the 100gr (3.50oz) weight from the left side and screw it into the right side of the Pruefroter. (Figure 3-21)

NOTE: IF A TIRE AND WHEEL ASSEMBLY IS USED THE TEST WEIGHT MUST BE ATTACHED ON THE OUTSIDE OF THE WHEEL EXACTLY 180° FROM THE WHERE THE INNER WEIGHT WAS ATTACHED.

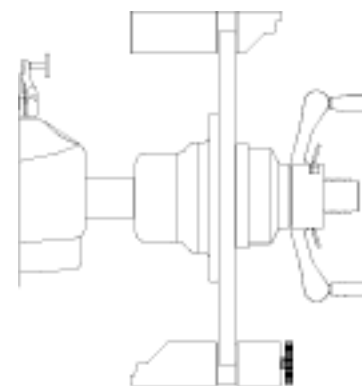


Figure 3-21

Lower the wheel guard to begin the spin cycle. After the shaft comes to a stop the display will change to "5".

5. Remove the Pruefrotor from the shaft.

NOTE: IF USING WHEEL AND TIRE, LEAVE ON SHAFT

NOTE: FOR A MOTORIZED UNIT THE TECHNICIAN CAN EITHER REMOVE THE PRUEFROTOR FROM THE SHAFT OR LEAVE IT ON THE SHAFT.

Spin the shaft by lowering the wheel guard. After the shaft comes to a stop the display "6".

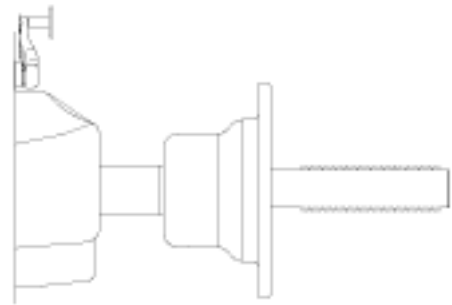


Figure 3-22

6. Attach the calibration weight to the inside of the flange plate and lower the wheel guard to begin the spin cycle. After the balancer comes to a stop the new calibration factors are stored into memory.

CALIBRATION COMPLETE

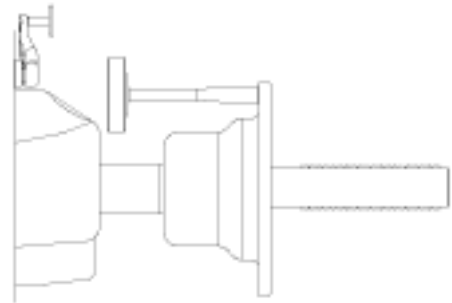


Figure 3-23

C84 COMPENSATION OF THE RESIDUAL MAIN SHAFT UNBALANCE

NOTE: THIS CODE MUST BE USED AFTER C83 IS PERFORMED. THE VALUES PRODUCED ARE STORED AND USED FOR EVERY SUBSEQUENT UNBALANCE MEASUREMENT WHERE C4 IS DISABLED.

1. The digit "1" in the left display to indicate the step number. All adaptors, cones and wheels must be removed from the machine shaft. (Figure 3-
2. Lower the hood to begin a spin cycle. After the spin is complete the machine will sound a tone and the function will exit. The machine stores the new compensation values and exits to the service menu.

CALIBRATION COMPLETE

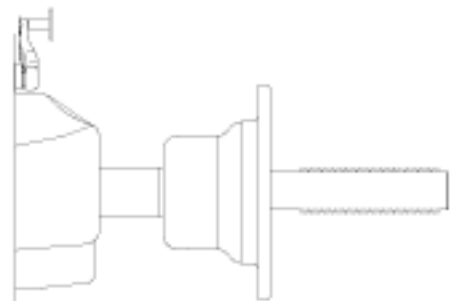


Figure 3-24

C85 CALIBRATION DATA TRANSFER FROM CPU PCB TO ENCODER PCB

Turn on the machine after the encoder replacement and C85 will be displayed. Press the <F> button and some beeps will be emitted, an auto test and a power on will automatically be performed. Data is now transferred from the CPU to the Encoder.

NOTE: IF THE ENCODER PCB MEMORY IS EMPTY OR THE SOFTWARE RELEASE LOADED ON THE CPU MATCH WITH THE DATA OF THE ENCODER, CALIBRATION DATA WILL BE AUTOMATICALLY STORED IN THE ENCODER BOARD MEMORY; IF THE ENCODER BOARD HAS ANOTHER RELEASE MEMORIZED, FACTORY CALIBRATION IS REQUIRED.

C86 CALIBRATION DATA TRANSFER FROM ENCODER PCB TO MAIN CPU PCB

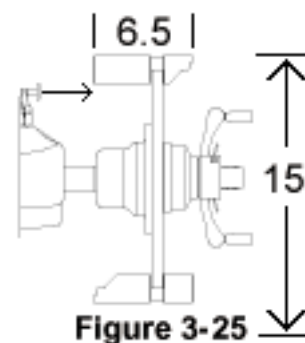
Turn on the machine after the CPU replacement and C85 will be displayed. Press any <±> button to change the display to read C86 and press the <F> button. Some beeps will be emitted, an auto test and a power on will automatically be performed. Data is now transferred from the Encoder PCB to the Main CPU

NOTE: IF THE CPU BOARD MEMORY IS EMPTY OR THE SOFTWARE RELEASE LOADED ON THE CPU MATCH WITH THE ONE OF THE ENCODER, CALIBRATION DATA WILL BE AUTOMATICALLY STORED IN THE CPU BOARD MEMORY; IF THE ENCODER BOARD HAS ANOTHER RELEASE MEMORIZED, FACTORY CALIBRATION IS REQUIRED.

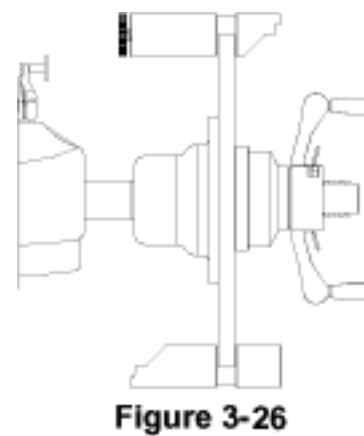
C88 ANGULAR UNBALANCE POSITION

NOTE: A TIRE AND WHEEL ASSEMBLY MAY BE SUBSTITUED IN PLACE OF THE PRUEFROTOR. THE ASSEMBLY MUST BE BALANCED BELOW 10 GRAMS IN THE NORMAL WEIGHT PLACEMENT MODE BEFORE CONTINUING.

1. Mount the Pruefrotor on the balancer shaft and enter in the parameters of the Pruefrotor using the balance screen. Activate the service code C88 from the service menu. Press the "F" button to begin the measurement run. (Figure 3-25)



2. Attach the 100 gram weight to inside of the Pruefrotor and press the "START" button. (Figure 3-26)



3. After the shaft comes to a complete stop rotate the shaft to locate the 100 gram weight at "**BOTTOM DEAD CENTER**" position. Press the <F> key to save the data. (Figure 3-27)

CALIBRATION COMPLETE

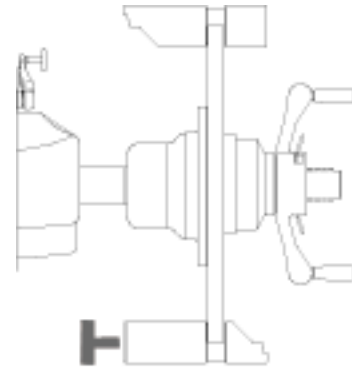


Figure 3-27

C111 MEASURING THE BELT TENSION

Displays: **C.11**

Lift the belt for 1cm (half a inch) and release it. The measuring will start and a moving — in the left seven segment display will appear. After measuring, the belt tension in Hz. will be shown in the right display. Right adjustment value is 193 Hz (tolerance is + 8 / - 15 Hz).

FACTORY CALIBRATION SEQUENCE

If major service is required it is recommended that a complete factory calibration be performed on the balancer.

Perform service codes in the following order;

1. C80 (only 1400-1500).
2. C81
3. C82 (only 1500)
4. C83
5. C84
6. C88

The machine is now ready for use.

SERVICING THE BALANCER

NOTE: BEFORE OPENING THE MACHINE FOR SERVICE, DISCONNECT ELECTRICAL SUPPLY LINE AND USE THE LOCKOUT / TAGOUT PROCEDURE.

The balancer is supplied with 110/230 VAC . It is critical to have the proper input voltage in order for the balancer to operate correctly. The balancer performs a systems check on initial power up. If a problem is detected the balancer will emit random beeps.

To check power cable:

- Disconnect the power supply from the balancer.
- Using a VOM, check for an output voltage at the end of the power plug 230VAC +/- 10%VAC Model 1500 or 110VAC ± 10% Model 1400 & 1200.

To check power to power supply box:

- Remove the weight tray.
- Using a VOM check for 230VAC at the power supply board, X41 pins 2&3 all balancers.

CONTROL PANEL REMOVAL & REPLACEMENT

The Digital Display Board is mounted directly to and behind the keypad on each balancer (Figure 3-28).

- Using a philip screw driver, remove to (8) screws holding the Display Panel to the upper Display. Gently pry the display forward.
- To remove the Display Board unplug the membrane panel and simply remove the (4) 8mm nuts holding it onto the backing plate.
- Once the keypad is removed from the backing panel it cannot be reused. The keypad can be removed by gently peeling back at a corner. If a keypad is suspect for replacement, it is suggested testing a new keypad before replacement.

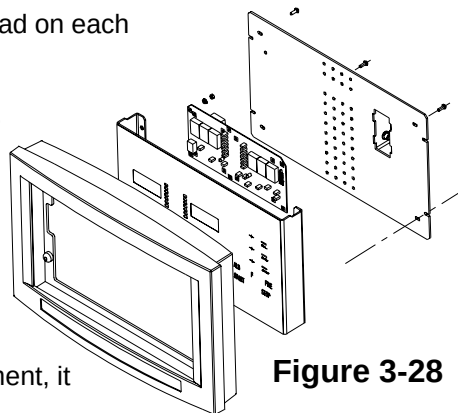


Figure 3-28

MAIN PROCESSOR REPLACEMENT

1. Disconnect the power from the unit.
2. Locate the Main Processor PCB, in the Power Supply Box on the motorized balancer.
3. Insert the program EEPROM in the socket on the processor board. (Figure 3-29)

NOTE: THE NOTCH ON THE END FACE OF THE EPROM MUST POINT TOWARDS THE NOTCH ON THE SOCKET OF THE PCB.

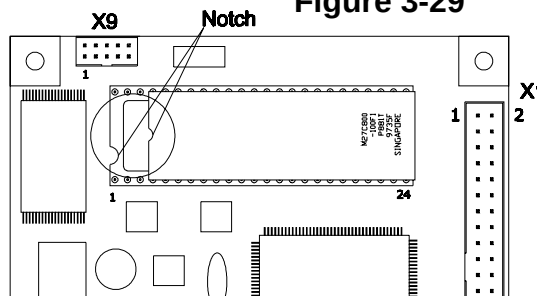
4. Plug the power cable into the balancer and switch the balancer to the on position. The balancer will emit three beeps. The upload will take approximately 45 seconds. After the completion of the upload the balancer will continuously emit beeps.

CAUTION!: DO NOT REMOVE POWER FROM THE UNIT DURING THE UPLOAD PROCESS, PERMANENT DAMAGE TO THE MAIN PCB WILL OCCUR.

5. When the upload is complete remove power from the balancer. Remove the EPROM off of the socket using a screwdriver, and place it in packaging for transport. Reassemble the balancer and apply power and perform a complete factory calibration.



Figure 3-29



TO ACCESS THE INSIDE OF THE MACHINE

1. Remove the screws from the front and side of the weight tray. (Figure 3-30)
2. Standing at the front of the machine, rotate the SAPE arm to it's full most outward position. Lift and remove the weight tray. Avoid breaking or damaging wire harnesses. Harnesses may be held in place with various retainer clips.

NOTE: WHEN INSTALLING THE WEIGHT TRAY, BE CAREFUL NOT TO CRUSH WIRES.

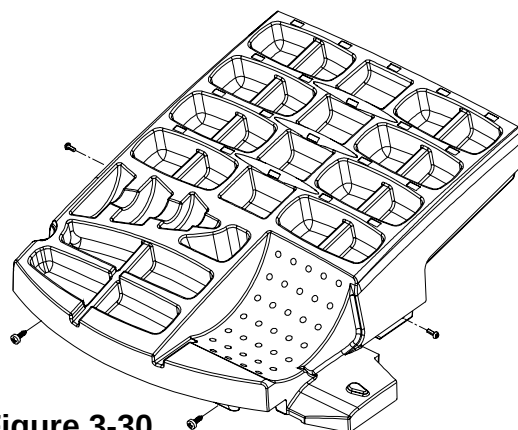


Figure 3-30

POWER SUPPLY BOX

All Balancers

1. Disconnect the power from the rear of the machine.
2. Remove the weight tray.
3. From the rear of the machine remove the two screws holding the Power Supply box. (Figure 3-31) simply pull the box out the back paying special attention to the wiring harness that are connected.
5. Un-plug each of the harnesses from the power supply box marking each harness to ensure correct installation.

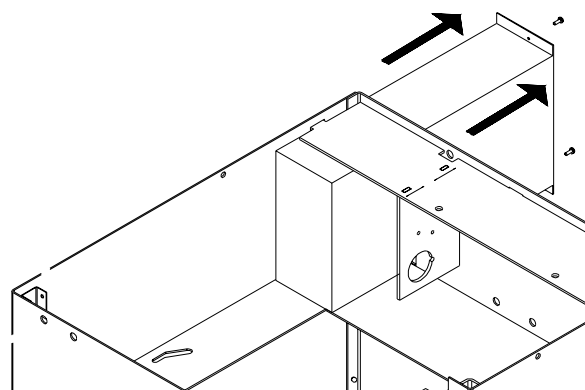


Figure 3-31

REMOVING THE POWER ENTRY MODULE:

1. Remove and open the retrofit Box as described.
2. Disconnect all internal wiring.
3. Remove the whole PEM.

INSTALLATION OF THE POWER ENTRY MODULE:

1. Ensure the On/Off switch will be situated closest to the top of the Box, after inserting the retrofit. Box correctly into the balancer.
2. Connect the leads to the PEM, while leading the cables through the rectangular hole of the Box.
3. Insert the PEM through the rectangular hole of the Box. Snap it into place.
4. Connect the green/yellow lead to the central earth bracket, next to the Protected Earth sticker.
5. Connect the other 2 leads to Connector X41.
6. Ensure the green/yellow lead from Connector X41 is also fitted onto the central earth bracket.
7. Ensure all screws and spacers are (re)fitted.
8. Close and mount the retrofit Box.

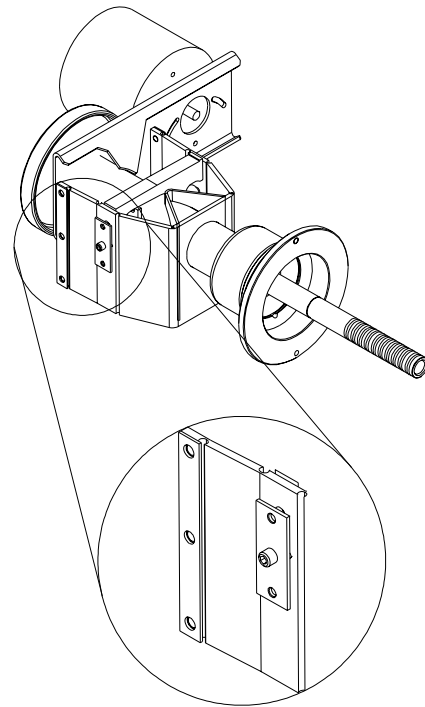
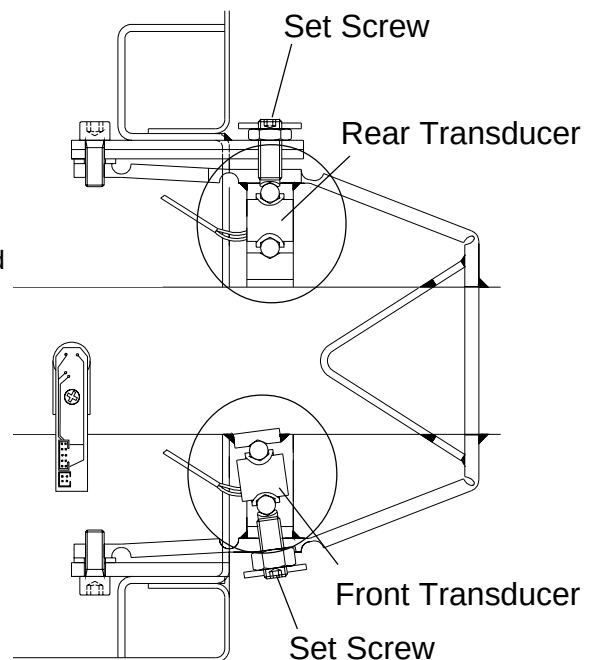
TRANSDUCER REMOVAL

- The transducers are held in place with setscrews and jam nuts.
- Disconnect the power from the rear of the machine.
- Remove the display panel.
- Remove the weight tray.
- Using a 2.5mm hex key remove the preload plate. (Figure 3-32)
- Using a 13mm wrench loosen the jam nut.
- Using a 5mm hex key, back the set screw off by turning counterclockwise. (Figure 3-33) Do not lose the ball bearings on each end of the transducers. These allow the transducer to center easily on the vibratory member.
- If the transducer is being replaced using a marker mark the front and rear transducer harnesses. Cut the two wires at the transducer. The positive lead of the harness is marked with a black band. (When using a harness and transducer assembly, this step is unnecessary.)

INSTALLATION OF TRANSDUCER

- The front and rear transducer must be installed correctly in order for the balancer to function correctly. (Figure 3-33) The rear transducer uses the last 2 wires pins 15-16 in the harness.
- Connect the positive and negative lead to the transducer. The positive lead is marked with a black band.
- Insert the clip into the transducer firmly snapping it into place. Once the wire is installed it cannot be removed without destroying the transducer.
- Apply a small amount of grease to each end of the transducer. Place the ball bearings in place on the transducer. Place the transducer assembly in the vibratory system.
- Finger tighten the set screw to position the transducer. The wire connection should be on the bottom. A properly installed transducer will be able to rotate freely but must have **no** side to side motion.
- Snug the jam nut that holds the setscrew. This nut should be tightened solidly, but need not be extremely tight. Recheck the transducer to ensure that no lateral movement exists after tightening the jam nut. Adjust as necessary.
- Hold the pre-load plate in position up to the jam nut and finger tighten the set screws to just hold the plate in place without movement. Tighten the upper screw $\frac{1}{2}$ turn, then tighten the lower screw one full turn, then tighten the upper screw an additional $\frac{1}{2}$ turn.
- Reassemble the complete balancer and perform a complete factory calibration to ensure proper operation.

NOTE: MOVING THE TRANSDUCER AFTER CALIBRATION WILL CHANGE THE ACCURACY AND REQUIRE FACTORY CALIBRATION C83 & C84.

**Figure 3-32****Figure 3-33**

VIBRATORY MEMBER REMOVAL

All Balancers

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the mechanical brake at the vibratory system.
- Disconnect the motor and encoder harness from the Power Supply box.
- Remove the rear transducer.
- Remove the access plugs from the front of the balancer. (Figure 3-34)
- Using 1/4" drive 6mm hex head SOT part # TMAM6E remove the six (6mm) hex bolts to the vibratory. Pay special attention of spacer placement. (Figure 3-35)
- Lift up on the vibratory member and remove.

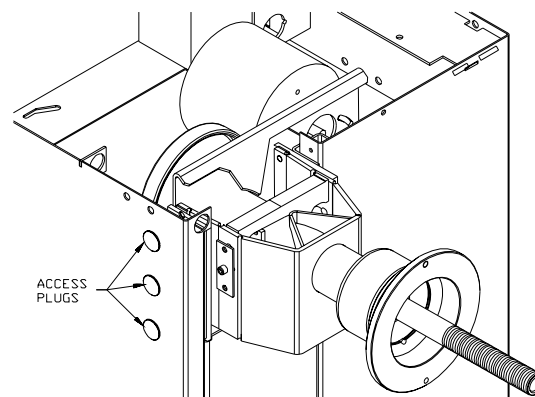


Figure 3-34

VIBRATORY INSTALLATION

All Balancers

- Lift and set vibratory member into the balancer housing.
- Insert spacers.
- With the aid of a helper start the two lower hex bolts.
- Install the 4 remaining hex bolts and tighten to 17ft. lbs. +/- 3ft. lbs.
- Install the rear transducer and follow transducer installation.
- Install mechanical brake and follow mechanical brake installation.
- Install weight tray.
- Connect power and follow all calibration procedures **C80, 81, 82, 83, 84, 88** and test.

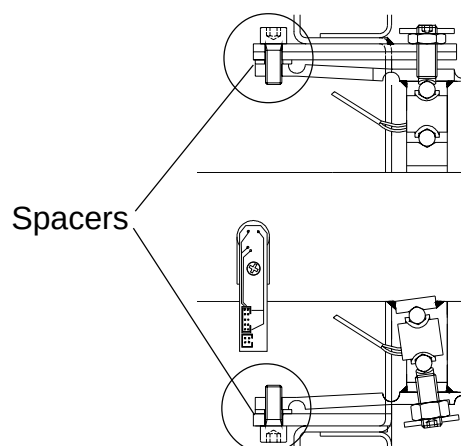


Figure 3-35

ENCODER REMOVAL

All Balancers

1. Turn the balancer off, unscrew and open the weight tray
2. Disconnect the flat cable, just the one that goes to the board (same cable goes to the piezo sensors, which does not need to be disconnected);
3. Remove the black tape, unscrew the screw and remove the board carefully;
4. Fix the new board connect the cable and close by placing new tape;
5. Turn the balancer on and C 85 will be displayed;
6. Press "F" button and few beeps will be emitted;
7. Auto test and a new switch on will be performed automatically, program version is shown on the display.
8. Perform a factory calibration (C83, C84 and C88).

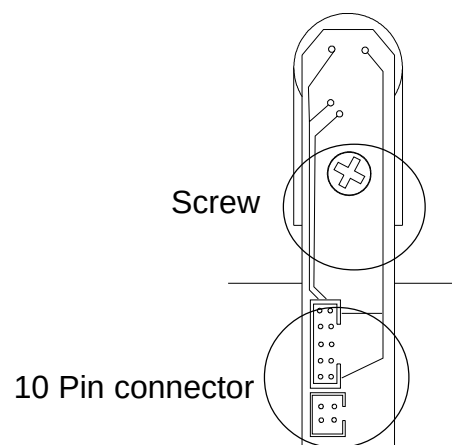


Figure 3-36

NOTE: BE CAREFUL NOT TO LET FOREIGN DEBRIS FALL INSIDE THE TUBE.

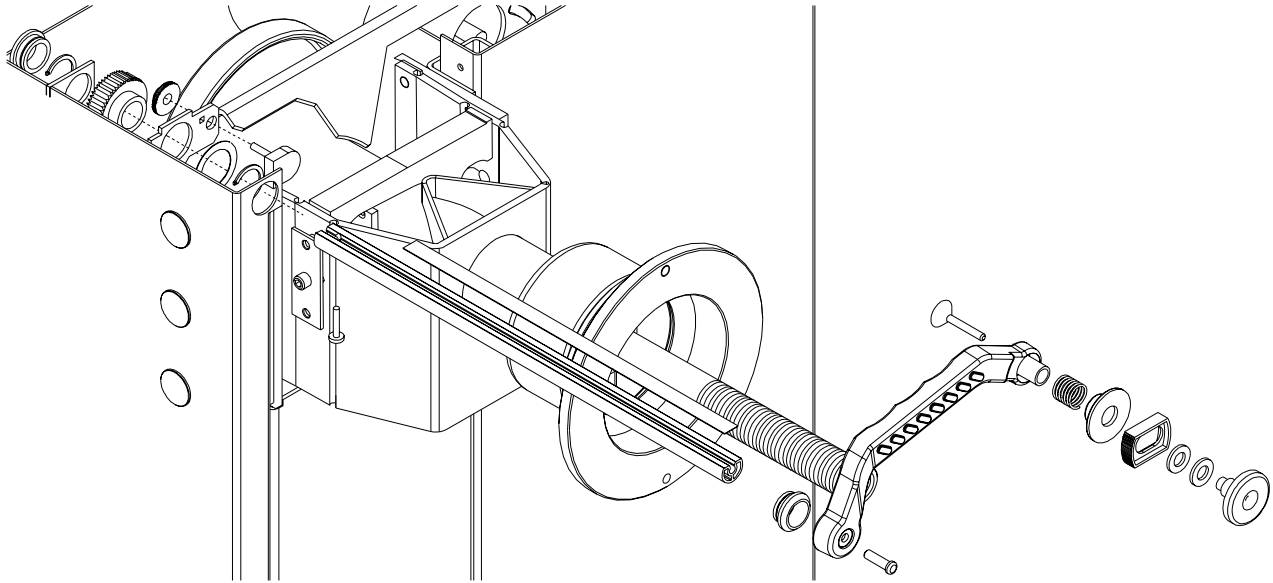


Figure 3-37

DIAMETER SAPE / POTENTIOMETER MODEL 1400 & 1500

- Disconnect the power from the rear of the machine.
- Remove the Display panel.
- Remove the weight tray.
- Disconnect the 2D SAPE harness from the Main Processor Board.
- Remove the 10mm nut holding the SAPE wheel to the mounting bracket and slide the cog wheel off of the potentiometer shaft. (Figure 3-37)
- Remove the 13mm nut holding the potentiometer to the frame.
- Reverse procedure for installation.

DIAMETER SAPE / POTENTIOMETER ADJUSTMENT

- Install 5K potentiometer onto bracket and tighten 13mm nut.
- Install cog wheel onto potentiometer shaft and hand tighten 10mm nut. (Figure 3-37)
- Attach SAPE harness to Power Supply Board.
- Run **C80 & 81** for SAPE calibration.

SAPE GAUGE

- To remove the index finger, remove the phillips screw from the backside of the gauge.
- To remove the SAPE arm remove the phillips screw that attaches to the distance rod.
- To remove the distance rod, disconnect the diameter string from the end of the rod.
- Slide the distance rod completely out.
- Reverse procedure for installation.

DISTANCE SAPE / POTENTIOMETER 1400 & 1500

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the 1D SAPE return spring from the lower base assembly.
- Remove the 10mm nut holding the SAPE wheel to the frame.
- Remove the 13mm nut holding the potentiometer to the frame (Figure 3-38)

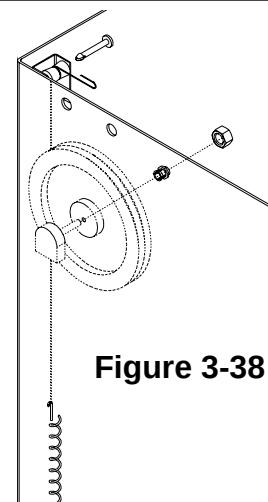


Figure 3-38

DISTANCE SAPE / POTENTIOMETER INSTALLATION 1400 & 1500

- Install 10K potentiometer onto bracket and tighten 13mm nut.
- Install SAPE Wheel onto potentiometer shaft and hand tighten 10mm nut.
- Attach SAPE thread to return spring.
- Hook return spring to the lower base of the cabinet.
- Route SAPE thread over guide roller.
- Manually turn SAPE wheel counterclockwise and hold it into position. (Figure 3-39)
- Loop SAPE thread around SAPE wheel and release the SAPE wheel. (Figure 3-39)
- Test SAPE assembly by pulling on the SAPE arm to it's full out position several times. Make sure there is no binding.
- **C80 & C81** for SAPE calibration.

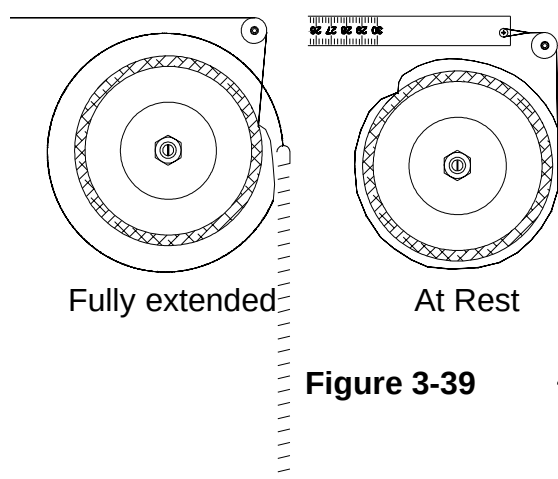
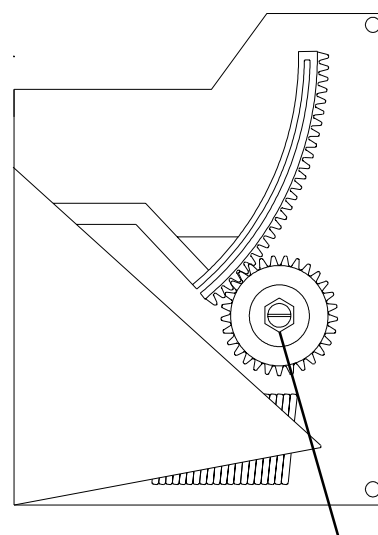


Figure 3-39

WIDTH SAPE / POTENTIOMETER INSTALLATION

Model 1500

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the 3D SAPE wire from the Power Supply box and gently pull the wire through the hood tube.
- Remove the three screws holding the top cover on the SAPE arm.
- Remove the three screws holding the bottom cover on the SAPE arm.
- Remove the 10mm nut holding the gear to the potentiometer. (Figure 3-40)
- Remove the 13mm nut holding the potentiometer.
- Reverse procedure for installation.
- The potentiometer comes equipped with a standoff, insert the standoff into the hole in the housing.
- Reconnect all wiring.
- Run **C82** for SAPE calibration.



Adjustment Screw

Figure 3-40

MECHANICAL BRAKE CABLE

This type of brake consists of a two brake pads, fitted onto a bracket assembly. The friction material of the brake pads contacts and operate over the motor pulley. The brake is activated by pressing the foot pedal. The Bowden cable clamps the brake pad(s) tightly on the pulley. To keep the brake pad(s) away from the pulley while spinning, a spring is fitted in between the brake brackets.

Replacement:

1. Remove the 2 nuts of the Bowden cable
2. Remove the 2 screws that fix the clamp assy to the measuring head body
3. Replace the assy - remove the pin join the 2 clamps if you need to change only one of the 2 clamps
4. Screws the assy onto the measuring head body, place the 2 nuts and follow-up with the adjustments.

Brake Cable Adjustment

Adjust the 2 nuts that are on the threaded end of the Bowden cable, that run through the brackets. Please note that this adjustment should not require to have the foot pedal pressed down completely. The play for brake bracket (when moved manually) should be about 1.5 - 2 mm (approx. 1/12 of a inch). After adjustment, the brake pads should run free from the pulley if the foot pedal is not pressed down. Please note that the Bowden cable runs through a plastic tube (for easier replacement) and is spring loaded (under the bottom brake bracket).

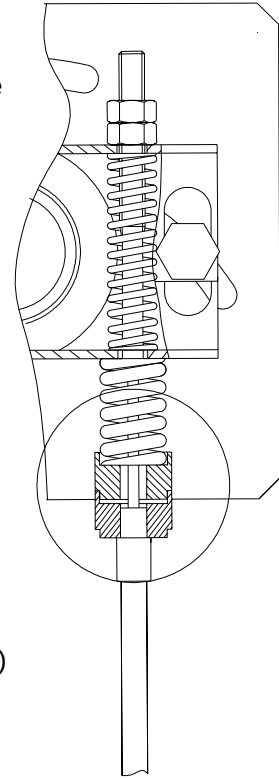


Figure 3-41

MOTOR REMOVAL

Removing the motor:

1. Switch the machine off and remove the main cable from the power inlet to prevent someone from applying power accidentally
2. Remove the weight tray
3. Remove the retrofit Box in order to disconnect the wiring of the motor Connector X42
4. Disconnect the brake by loosening the 2 nuts securing the Bowden cable to the brake top lever.
5. Release the tension from the belt by loosening the 4 distance bolts.
6. Unscrew all screws completely, except the top one.
7. Support the motor (to prevent it from falling into the cabinet) and remove the top distance screw.
8. Take off the motor and remove the V belt.

Installation of the motor:

1. Position the v-belt over the motor pulley;
2. Position the motor, guide the 4 distance bolts through the holes in the measuring head bracket.
3. Partially tighten the top screw;
4. Pace and fix the brake assy together with the motor, screws the 2 nuts of the Bowden cable. Tighten the screws that secure the motor (not firmly) .
5. Adjust the tension of the v-belt, check the value with the service code C 111. If needed loose and move slowly the motor left or right in order to tension plus or minus the V-belt re-tighten. NOTE: C 111 is only available starting from the program version .24
6. Connect the motor to the power Interface Board, connector X42
7. Mount the retrofit Box, connect all cables,
8. Ddjust and fix definitively (chapter 17,10) the partially tightened nuts of the Bowden cable to the top lever of the brake
9. Check if the brakes work properly
10. Re-connect all connectors, ensure the wiring does and will not conflict with rotating parts, fasten the weight tray and perform factory calibrations (C83,C84 and C88).

V BELT TENSION ADJUSTMENT.

The belt tension is an important factor for the lifetime of the main shaft bearings, belt life and the overall measurement accuracy.

When the tension is too high can generate:

- Wrong influence on extended measurement runs and visualize several Service Codes.
- Put unnecessary load on the ball bearings, generating stress
- Can produce fluctuations in the measurement

When the tension is too low:

- belt slipping, which will cause excessive wear and longer measurement runs, error codes, etc.
- it may cause disturbing squeaking noises as well.

To adjust:

1. adjust the tension of the v belt, by using the service code C 111 (available from the program version .24). Once this code is called up, the reading is a running “ - “.
2. After picking the belt a beep indicates the start of the measurement. After 3 sec. a second beep indicates the end of the measurement and the frequency is displayed. If the harmonic analysis doesn't found any significant frequency then “Err” is displayed until the next measurement is started.
3. The test should be repeated with different forces during picking the belt and with different sections of the belt (rotating the main shaft).
4. The frequency is displayed in a range from 100 Hz up to 300 Hz, **where the right value is 193 Hz (+8/-15).**

Figure 3-42 shows the relation between frequency and belt tension for a measuring head and a Poly-V belt 5PJ711 DIN7867.

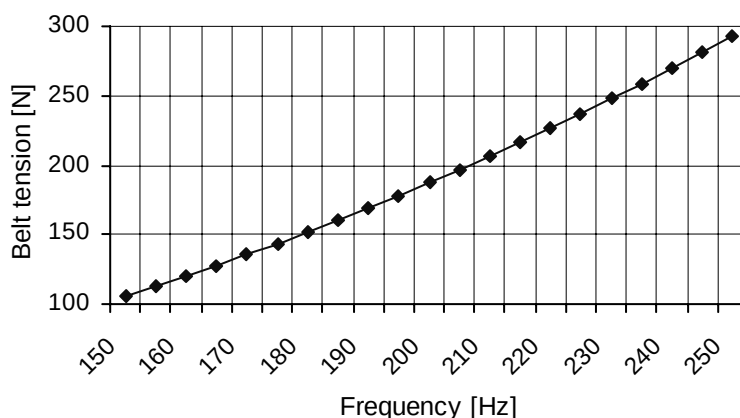


Figure 3-42

HOOD SWITCH / CAM / SPRING

- Place the wheel guard in the lower position
- Remove the top of the box of the wheel guard support, unscrew the cam and move it to left
- remove the switch and install the new one in the same position

Re-position the cam by placing the recess over the wheel's switch (normally opened). For a proper adjustment you should hear a “click” while lifting the wheel guard for approx. 10cm (4 inches).

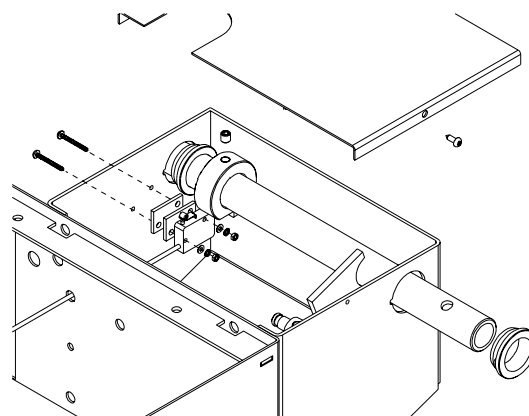
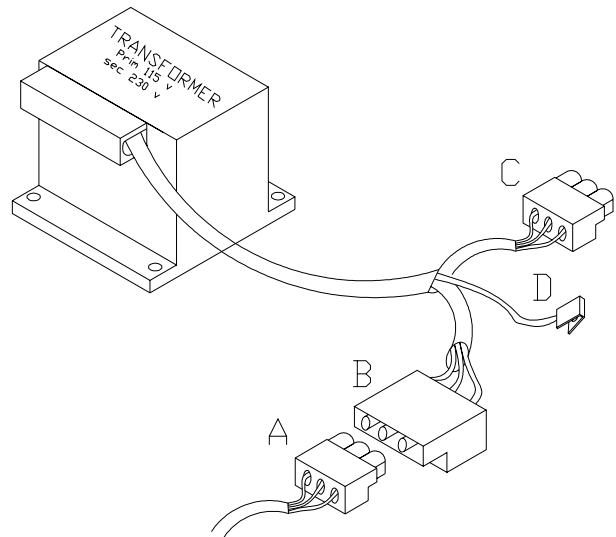


Figure 3-43

VOLTAGE MODIFICATION

The transformer is required to adapt the 1500 balancer to 115V main supply (1200 and 1400 come already at 115V); before proceeding, turn the machine off and pull out the power cable and carry out the following steps:

1. Switch the machine off.
2. Take off the weight tray from machine housing.
3. If missing , drill four 4.5 mm mounting holes in the cabinet.
4. Fasten the transformer (#0026329) with the four enclosed screws M 5x10.
5. Connect the green/yellow wire connector D, to the central grounding terminal.
6. Unplug connector A (X41 printed on the board) from power interface board and connect it with the B cable of the transformer connector.
7. Plug the C connector from the transformer cable to X41 connector of power interface board, ensure the wiring does and will not conflict with rotating parts. Install and fasten the weight tray.
8. Replace the electrical supply wire with the correct one for the 115 volt unit.



To transform a 1200 or a 1400 to 220V, disconnect B and C and connect A to the X41 connector and replace plug accordingly.

APPENDIX A CODES

KERNEL CODES

A complete error code consists of 6 hexadecimal digits.

Prefix	Digit 6	Digit 5	Digit 4	Digit 3	Digit 2	Digit 1
0X	Module ID		Priority ID	Error ID		
Digital Display	Left Display			Right Display		

Module ID: 2-digit hexadecimal value and indicates the software module which detected the error.

Priority ID: Represents the kind of error (message only, critical error).

Error ID: Determines the kind of the fault.

Module ID	Description
21	Time Service
22	I2C bus device driver
23	Serial device driver
24	Sound device driver
25	External AD converter
26	Internal AD converter
27	Temperature measurement
28	Piezo transducer
29	Incremental encoder Main shaft
2A	Incremental encoder belt disc
2B	Relay management
2C	Hand-spin brake
2D	Electromagnetic brake
2E	main supply line
2F	motor
30	Supervisor
31	Watchdog timer
41	Auto stop system
42	Data conditioning
43	Rim data management
44	Sape device
45	Display device
46	Keyboard device
47	Brake device
48	Motor device
49	Drive (Motor & Brake)
4A	Power clamp
4B	Incremental potentiometer
4c	Rim light
61	Balancing algorithm
62	Balancing calibration
63	Behind the spokes placement
64	<not used>
65	Optimisation
66	Measurement control

APPENDIX A CODES

81	Command language (Commands coming from the UI)
82	Calculator
83	Message Server (Message service from BK to UI)
84	Message Server (User messages from BK to UI)
85	Sleep command
86	Balancing Kernel : Test statemachine (eg selftest during startup)

A1	Event system
A2	User management
A3	State machine
A4	complex data type
A5	Persistent objects
A6	Pipe device
A7	Power on time counter (-> time stamp for error recording)
A8	Counter for total spins / in service-, in user mode

C1	Self test
C2	User interface
C3	User interface

Priority ID Description

0	Critical error (will be recorded in user mode)
1	Warning message
2	For information only
3	All of above, but will not be recorded in the error record (persistent objects p30 to p39)

Error ID Limits Description

F01		Not complete
F02		Invalid job Mod 2D, Brake : Module gets invalid event. Mod 49, Drive system : Internal error, command not valid in actual mode of operation Mod 66, Meas Control : Internal error. Module gets invalid user event. command not valid in actual mode of operation Mod C1, Self-test : Self-test failed, see error record for more information (kernel register err0,...err9 or User interface: C28).
F03		Out of memory
F04		Out of range Mod 27, Temperature: Out of Range
F05		Buffer full
F06		Channel not found
F07		Not found Mod 41, ASS : Time client not found Mod 44, SAPE : Time service not found during unregister Mod C1, Self-test : Self-test failed, result of test invalid
F08		Already exists
F09		In use Mod 44, SAPE : AWP already in use Mod 49, Drive system : Internal error, command not valid in actual mode of operation operation Many "490F09" errors in the error record indicates a malfunction of the pedal.
F0A		End of file
F0B		Drive full

Error ID	Limits	Description
F0C		Bad name
F0D		Xmit error
		Mod C3, User Interface : Communication Error between balancing kernel and user interface (BK <- UI). Machine should be restarted.
		This error can be caused by a bad connection of the RS232-E serial line. Check external and internal cabling.
F0E		Format failed
F0F		Bad parameter
		Mod 41, ASS : Invalid time specified
		Mod 44, SAPE : Bad parameter during calling time service
		Mod 81, cmd :Parameter of a kernel command is bad. Such an error can occur as a result from a hardware malfunction.
F10		Bad medium
F11		Error in expression
		Mod C3, User Interface : Communication Error between balancing kernel and user interface (BK -> UI). This error can be cleared by pressing STOP or Escape.
		This error can caused by a bad connection of the RS232-E serial line. Check external and internal cabling.
F12		Overflow
		Mod 41, ASS : Too many time clients
		Mod 44, SAPE : Overflow (e.g. invalid time period)
F13		Not implemented
F14		Read only
F15		Bad line
F16		Bad data type
F17		Not running (still not initialised)
		This error can occur after a measuring run, if the incremental encoder of the power clamp is not able to detect the reference mark (810F17). check the incremental encoders with C54, C74 (main shaft) and C98 (power clamp)
F18		Timeout
		Mod 31, Watchdog: Recorded during start-up: Watchdog causes last reset. Check error record (C28).
		Mod 42, Data cond. : Can't get data from external AD converter
		This error can caused by a malfunction of the incremental encoder. Check C74 and C54.
		A malfunction of the micro-controller board Check C75 if ADE1 and ADE2 displays valid results.
		Mod 44, SAPE : Communication timeout (No answer from AWP)
		Mod C1, Self-test : Self-test failed, test function does not response (timed out)
F20		Access denied
		Mod 49, Drive system : Access denied : e.g.
		Use of the clamp device if it is not available (not a power clamp machine?)
		- Requested action not allowed
50		UT_CMPLX_ERROR_MatrixSingular
60		ERR_VOLTAGE_ZERO
61		ERR_VOLTAGE_BELOW_LIMIT
63		ERR_VOLTAGE_ABOVE_LIMIT
64		ERR_VOLTAGE_really_HIGH
100		Keyboard : No time client available

Error ID	Limits	Description
101		ERROR_KEYB_NO_HARDWARE_AVAILABLE
102		ERROR_KEYB_ORDER_BUSY
120		Display (Digital) : No Hardware available
130		Bad parameter for the frequency of beep command
131		Bad parameter for the volume of beep command
132		Bad parameter for the sound file of beep command
133		Bad parameter for the repetition of a beep
134		Sound file corrupted
140		RS232-E : Wrong parameter for ioctl call.
141		RS232-E : Input buffer overrun occurred
142		RS232-E : Transmission error
143		FIFO_KORRUPT
144		FIFO_WRONG_ACTION
145		FIFO_EMPTY_READ
146		FIFO_FULL_WRITE
147		FIFO_STRING_ENDE
148		PIPE_NO_COMPLETE_MESSAGE_AVAILABLE
149		SER_WRONG_ACTION
14A		SER_NO_HARDWARE
14B		SER_ERR_RESET_FIFO
14C		SER_ERRORCODE_EXISTS
160		ERROR_PO_INIT_READORDER_FAILED
161		ERROR_PO_INCORRECT_DATA_OR_HEADER_SIZE
162		ERROR_PO_EEPROM_IS_FULL
163		ERROR_PO_I2C_WRITE_ORDER
164		ERROR_PO_NO_TIMECLIENT_AVAILABLE
165		ERROR_PO_ORDER_IS_BUSY
166		ERROR_PO_ORDER_IS_FULL
167		ERROR_PO_PRODUCTION_READ_WRONG_TYPE
168		ERROR_PO_EEP1_EEP2_ARE_DIFFERENT
169		ERROR_PO_CRC_EEP1_ERROR
16A		ERROR_PO_CRC_EEP2_ERROR
16B		ERROR_PO_ORDER_HAS_FAILED
16C		ERROR_PO_NOT_AVAILABLE
16D		ERROR_PO_CRC_EEP1_EEP2_ERROR
180		ERROR_I2C_QUEUE_FULL
181		I2C_ERROR_ORDER_NOT_FOUND
182		I2C_ERROR_ORDER_TOO_BIG
183		I2C_ERROR_ORDER_BUSY
184		I2C-Bus : No order in I2C queue
185		I2C-Bus : No active order in I2C queue
186		I2C_ERROR_TOO_MANY_SOP
187		I2C_bad_SDA
188		I2C_bad_SCL
189		I2C_busy
18A		I2C_no_Acknowledge
18B		No Acknowledge from device
18C		I2C_ERROR_NO_ACK_FROM_START
18D		I2C_ERROR_NO_ACK_FROM_STOP
18E		I2C_ERROR_NO_ACK_FROM_SEND1
18F		I2C_ERROR_NO_ACK_FROM_SEND2
190		I2C_ERROR_NO_ACK_FROM_RECEIVE

Error ID	Limits	Description
191		ERROR_I2C_SYNCHRONOUS_ORDER_TIMEOUT
192		ERROR_I2C_ASYNCHRONOUS_ORDER_TIMEOUT
193		ERROR_I2C_ORDER_HAS_FAILED
201		ERROR_DS_USER_BREAK
202		Drive system : Timeout during speed up - hand-spin only! speed does not settle after start command
203		ERROR_DS_SPEED_NOT_REACHED
204		Drive system : Speed slows down during measuring - speed falls below limit while measuring
205		Drive system : Wheel speeds up in reverse turn - Hand-spin only! main shaft rotating backwards on start command
206		Drive system : No acceleration during speed up or braking detected 1. Motor 2. Belt mounted? 3. Incremental encoder main shaft
207		Drive system : Slip detected (speed up to fast) 1. Wheel not clamped strong enough 2. no wheel or wheel mass too low
208		Drive system : Speed limit exceeded - speed exceeds security limit (mainly wheel guard open and drive management set to high speed)
210		Drive system : Clamping device got stuck in clamped position
211		Drive system : Clamping device got stuck in unclamped position
212		Drive system : Displacement limit exceeded during (un)clamping
213		Drive system : Belt disc rotates backward after clamping.
214		Drive system : Main shaft rotates during clamping (e.g. EMB defective?)
215		Drive system : Clamp device is locked
216		Drive system : Time limit for clamping process exceeded
300		Motor over-current detected by hardware. Over-current-LED on the power interface board will be cleared on the next activation of the motor
350	0.05 V	First Potentiometer : Voltage below measuring range (AD value : 0..10)
351	4.45 V	First Potentiometer : Voltage above measuring range (AD value : 1014..1024)
360	0.05 V	Second Potentiometer : Voltage below measuring range (AD value : 0..10)
361	4.45 V	Second Potentiometer : Voltage above measuring range (AD value : 1014..1024)
370	0.05 V	Third Potentiometer : Voltage below measuring range (AD value : 0..10)
371	4.45 V	Third Potentiometer : Voltage above measuring range (AD value : 1014..1024)
380	4.50 V	ASS : Voltage magnet below limit - off state.
381	1.00 V	ASS : Operating Voltage magnet below limit - on state.
382	2.00 V	ASS : Operating voltage magnet above limit - on state.
383	0.5 s	ASS : Operating Voltage magnet recharging time above limit
400		During measuring run : Data conditioning can't get proper speed information.
401		During measuring run : User break. (Measuring run stopped by user)
402		During measuring run : Temperature information invalid, 20°C used instead.
403		During measuring run : Can't perform transducer correction.
405		Channel 1 - channel 2 Phase shift too big

Error ID	Limits	Description
410		Transducer 1, No signal
411		Transducer 1, transimpedance to low
412		Transducer 1, RC time constant out of range
415		Transducer 1, transimpedance amplifier; idle voltage out of range
416		Transducer 1, DC amplifier; idle voltage out of range
418		Transducer 1, amplifier saturation
419		Transducer 1, Transfer function out of range
420		Transducer 2, No signal
421		Transducer 2, transimpedance to low
422		Transducer 2, RC time constant out of range
425		Transducer 2, transimpedance amplifier; idle voltage out of range
426		Transducer 2, DC amplifier; idle voltage out of range
428		Transducer 2, amplifier saturation
429		Transducer 2, Transfer function out of range
430		Transducer 1&2, No signal
431		Transducer 1&2, transimpedance to low
432		Transducer 1&2, RC time constant out of range
435		Transducer 1&2, transimpedance amplifier; idle voltage out of range
436		Transducer 1&2, DC amplifier; idle voltage out of range
438		Transducer 1&2, amplifier saturation
439		Transducer 1&2, Transfer function out of range
500		BL_BAL_ERROR_NoConverge
501		BL_BAL_ERROR_ResultInvalid
502		BL_BAL_ERROR_TooMuchLoops
510		BL_BAL_ERROR_NoCalUser
511		BL_BAL_ERROR_FailCalUser
512		BL_BAL_ERROR_SideCalUser
NOTE: C1 = FRONT TRANSDUCER C2 = REAR TRANSDUCER		
560		c1 value too low, if a user calibration tool assumed
561		c2 value too low, if a user calibration tool assumed
565		c1 value too low, if a 100g weight and calibration rotor assumed
566		c2 value too low, if a 100g weight and calibration rotor assumed
570		c1 value too high, if a calibration rotor only assumed
571		c2 value too high, if a calibration rotor only assumed
580	-30°C	Temperature below -30°C or hardware fault.
581	100°C	Temperature above 100°C or hardware fault.
585	0.23 V	Temperature Input near to ground Voltage.
586	4.05 V	Temperature Input near to reference Voltage.
601		Internal error : To many event sinks
602		Internal error : Cannot register event sink
603		Internal error : Invalid event level
701		ERROR_IEMS_INV_PARAM
702		Incremental encoder not initialised. Software is not able to detect the reference mark.
703		Incremental encoder : Counter - reference mark mismatch
705	2.50 V	Opto electronic, No voltage on shunt resistor
706	4.30 V	Opto electronic, VCC on shunt resistor
707	16 mA	Opto electronic, Current through LED below limit
708	20 mA	Opto electronic, Current through LED above limit

Error ID	Limits	Description
710		Hand-spin with electromagnetic released brake - main shaft rotates backwards
800	170 V	Line voltage below limit
801	265 V	Line voltage above limit
804	275 V	Line voltage much too high
810	5.10 V	VCC below limit
811	5.35 V	VCC above limit
820	5.00 V	Keyboard/display voltage below limit
821	5.35 V	Keyboard/display voltage above limit
830	4.50 V	External voltage (pedal) below limit, see keyboard module
831		External voltage (pedal) above limit, see keyboard module
900		Power fail detected
9FF		ERROR_SELFTEST
e01		ASA: Status of an activated order has changed due to network manager or shop management software activities.

ERROR CODES

<u>E-Code</u>	<u>Description of Error Code & Solution</u>	<u>6-Digit Code</u>
6	User calibration failed 1. Calibration tool not attached during factory calibration; 2. Check the V-belt tension; 3. Check the motor	None
10	SAPE arm removed from the home position during wheel spin. During rotation detection an offset value > 0 mm was detected > Display clears after several seconds. 1. Bring SAPE to its home position 2. Re-spin the wheel 3. If the error appears again, calibrate the SAPE (offset) (Service Code 80)	None
11	During power up procedure, the SAPE arm was not at its home position. 1. Bring SAPE to its home position 2. Re-start the unit 3. If the error appears again, calibrate the SAPE (offset) (Service Code 80)	None
NOTE: THE USER CAN CONTINUE BY ENTERING DATA MANUALLY UNTIL SERVICE ARRIVES. EXIT THE ERROR CODE BY PRESSING STOP BUTTON.		
12	A wheel with an entered diameter, smaller than the HWM rim diameter limit, was balanced in HWM mode. 1. Check the diameter entered and calibrate the SAPE (diameter) if required.	None

E-Code	Description of Error Code & Solution	6-Digit Code
13	During power up procedure, the SAPE arm was not at its home position. 1. Bring SAPE to its home position 2. Re-start the unit 3. If the error appears again, calibrate the SAPE(diameter) (Service Code 80 & 81)	None
NOTE: UNTIL SERVICE WILL COME, END USER CAN FOLLOW-UP WORKING ENTERING DATA MANUALLY EXIT THE ERROR CODE BY PRESSING STOP BUTTON.		
16	User calibration failed Calibration weight attached erroneously to the flange	None
22	Speed Up timeout It takes too long to reach the required wheel speed 1. Check if the shaft rotates lightly: correct bearings, brake adjustments, etc. 2. Check the signals from the opto encoder. 3. Check the belt tension. 4. Check the signals and power to and from the motor.	492202
23	Speed not reached 1. Check if the shaft rotates lightly: correct bearings, brake adjustments, etc. 2. Check the signals from the opto encoder. 3. Check the belt tension. 4. Check the signals and power to and from the motor.	492203
24	Speed low 1. Check if the shaft rotates lightly: correct bearings, brake adjustments, etc. 2. Check the signals from the opto encoder. 3. Check the belt tension. 4. Check the signals and power to and from the motor.	492204
25	Shaft rotation in wrong direction 1. Hand spin: turn shaft in correct direction. Motor spin: connect motor correctly. 2. Check opto-encoder signals and connections.	492205
26	No Acceleration 1. Check motor, belt. 2. Check opto-encoder signals and connections.	492206
27	Slip detected 1. Tighten quick nut. 2. Check motor, belt. 3. Check opto-encoder signals and connections.	492207
28	Speed limit not reached 1. Check motor, belt. 2. Check opto-encoder signals and connections.	492208
29	Start doesn't perform 1. Start button pressed white open wheel guard; 2. Check the micro switch regulation	None
50	Factory Calibration not completed Perform Factory calibration, Service Code 83	622510

51	User Calibration failed 1. Retry User Calibration 2. Check if vibratory system is mounted correctly, if no external vibrations are relayed, etc. 3. Check transducers 4. Check opto-encoder signals	622511
52	User Calibration on opposite side to factory calibration 1. Mount User Calibration Weight on the left hand side of flange. 2. Perform Factory Calibration, Service Code 83	622512
82	Self test disturbed 1. Don't touch the balancer during switch on; 2. Check the temperature sensor	None



Accu Industries, Inc
P.O. Box 15540 / Richmond, Va. 23227
11126 Air Park Road / Ashland, Va. 23005
phone: 804.798.8922
toll free: 1.800.551.2228
fax: 804.798.6742